RAILROAD GAZETTE

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Contributions.

Roller Side Bearings.

Chicago, June 17, 1898.

To the Editor of the Railroad Gazette:

Your remarks in the issue of June 10th recall the fact that roller side bearings for cars have been tried quite extensively and abandoned, the objection being that they would not roll, but soon wore flat; the flat spot holding the roller in one position, the sliding of the top bearings soon destroyed it. In designing the roller bearings, it appeared to be assumed that the truck revolved on a circle, the center of which is the center pin, and that rollers would naturally revolve and carry the car body.

There is another movement, that of the end of the car body from the center of the back truck to the end of the car, due to the departure from a straight line on a curve, the movement of the car body being proportionate to the curvature and the length of car body. This movement of the car body would be almost a right angle to that of the rollers, which, with the increased weight in curving, would prevent the roller moving, and wear flat spots on it. Efforts were made to overcome the difficulty, but apparently without success. Rollers gradually disappeared and only lately came to the front again.

At the best, a roller is a crude affair. It appears as though the end of the nineteenth century might produce a more scientific and mechanical arrangement. It appears to the writer that the proper place to carry the weight of the body of the car is on the center plates. This could be done by abandoning the wood body bolster, which should have been done long ago, and substituting a steel construction. The center plates should be so increased in width that they would take up the roll of the car. There have been cars running for years that have center plates 18 and 24 in. wide. These cars have done good work and no objections to the large center plate developed. With steel body bolsters properly designed, large center plates and trucks designed to carry the weight on the center, there is no apparent limit to the load, and the side bearings would be relegated to their original design of carrying no part of the load, but as a safety device to operate in case of accident.

JAMES M. BOON.

The Cost of Curves.

To the Editor of the Railroad Gazette:

I have charge of a railroad location party, and am endeavoring to inform myself on some matters in regard to which I take the liberty of writing you.

Briefly put, for a fast passenger and heavy freight business, with very low gradients, less than one-half of one per cent., how much more money can be profitably spent in construction to secure tangents over and above what would be required to construct the line with more frequent curves, often changing direction?

I assume there are three prime considerations that enter into the solution of the problem:

First—Comfort of the passenger.

Second—Cost of maintenance of track and rolling stock.

Third—Cost of operation.

As I take it, the first is almost wholly a matter of conjecture, and no definite money value can be attached to the line with more tangent and less curvature, over and above that with less tangent and more curvature often changing in direction; but, whatever additional value the former may have, will be principally a matter of opinion, the amount of passenger traffic depending more on rates, scenery, times of arrival and departure of trains, location of terminals, than on amount of tangent, roadbed being in similar condition, as well as rolling stock.

If this is correct, then the other two considerations would appear to be those on which the solution would depend, and to which a money value can be given. I have no data giving the cost of maintenance, or operation, on either curve or tangent, other things being equal, but only of total line, with no reference to gradients or curvature.

The problem might be put in this shape: If I can grade 1,000 ft. of track with 200 ft. of 6 deg. curve for $2,000, how much more may I profitably expend on this construction so that there will be only 100 ft. of curve (6 deg.) in the 1,000 ft.? Or, how much can I profitably expend for each degree of curvature omitted, whatever the curve be? Or, is it right to say I can expend, say, $10, to throw out one deg. in a six deg. curve, and can profitably spend the same amount to throw out one deg. in a one deg. curve?

ASSISTANT ENGINEER.

[Some notes on this subject will be found on the editorial page.]

Short Front Ends.

Pittsburgh, Pa., June 20, 1898.

To the Editor of the Railroad Gazette:

In the description of the Coburn locomotive front end and spark extinguisher, which appears in your issue of the 17th inst., only two advantages of a short front are recited, viz., "First, the direct saving of some weight and material, and, second, there is saved the cost of cleaning the front ends and loading and unloading cinders." These, while undoubtedly existing, are neither the only or the most important ones, and it seems to me that the improvement in steaming capability by the use of a short front as compared with a long one, should be given first place.

That the interposition of a smoke-box extension of large volume (proportioned only by the rule of thumb of the victim of the craze) between the tubes and the stack, should impair the steaming of a locomotive, appears reasonable in principle, and has been amply demonstrated in practice. The writer has never been able to find that the advocates of the extension have adduced a single sound principle or theory in its support; have disproved the claim that, other things being equal, an engine would not steam as well with it as with a short front; or justified the additional cost of attachments, waste of fuel, and objections as to trouble with front ends, and disposition of matter deposited in them, which are undeniable.

Until comparatively recently the railroads have patiently struggled under this burden, apparently either from force of habit or reluctance to admit that they had made a mistake in loading themselves with it, but the indications are encouraging that they will soon be relieved from it. Many applications of short fronts have been made, replacing extensions, with entirely satisfactory results, and a considerable number of the latest large-sized engines, both passenger and freight, have been built with short fronts, and are doing good service with them. The Coburn front is based on correct principles, and its adoption on the entire locomotive equipment of the Chicago, Indianapolis & Louisville will do much to promote good practice.

The use of an extension on a compound locomotive, in which the exhaust is, or is claimed to be, so light as not to pull the coal through the tubes, appears strangely inconsistent, and an explanation of why it is used would be interesting. The latest two-cylinder compound consolidations of the Norfolk & Western Ry., which seem in other particulars to be extremely well designed machines, are handicapped by huge smoke-box extensions. It may be that the designer has submitted to them in order to give room for the receiver, but this is not necessary, as the receiver might have been set vertically in a smoke-box of reasonable length, with better results in all particulars.

J. SNOWDEN BELL.

The Thirty-Second Annual Meeting of the Master Car Builders Association.

The thirty-second annual meeting of the Master Car Builders' Association was opened Wednesday morning, June 15, at the Saratoga Theatre, Saratoga, N. Y. An address of welcome was made by Mr. A. P. Knapp, President of the Village of Saratoga Springs. This was followed by an address by Col. Ashley W. Cole, Chairman of the Board of Railroad Commissioners of the State of New York. To this address Mr. J. H. McConnell replied, giving some of the results of the work of the M. C. B. Association.

President S. A. Crone, in his opening address, spoke of the general improvement in business following the depression of the past few years, the large number of cars built during the past year, and the call made upon the railroads at this time because of the war. He also made an unusual number of recommendations for the consideration of the Association which, in part, are as follows:

I would suggest that the By-laws covering the date of the opening day of the convention be changed so as to provide for such opening on the second Wednesday in June, instead of the second Tuesday, as at present.

I would recommend that the constitution be so changed as to admit one railroad commissioner from each state, upon application, to associate membership, during his term of office, such application to be voted on at the same session at which it may be received.

A resolution should be adopted at this convention recommending to the Interstate Commerce Commission the advisability of increasing the maximum height of couplers to 35 or 35½ inches, experience having demonstrated that three inches' variation to cover new cars when empty, and old cars when loaded, is not sufficient. For measuring, adjusting and passing cars, I would suggest that loaded cars be ¾ inch below maximum height. This would insure that loaded cars when empty, and empty cars when loaded, would comply with the law.

In consequence of the large number of couplers of the Master Car Builders' type in use, and the vast difference in construction and the material used, it would seem desirable that a test be adopted as recommended practice, similar to the present test for wheels and axles. This would insure a higher standard of perfection in materials and design.

As the rules governing the loading of logs, lumber, structural material, girders, etc., will come up for recommended changes, I would suggest that instructions covering the loading and securing of block stone and rails be included.

In cases where the interior of a freight car is damaged by lading, such as acids, oil, etc., I would recommend that the railroad controlling such loading be held responsible, except where special cars are furnished by owners.

Owing to the differences of opinions concerning the use of dummy coupling hooks on freight equipment, I would recommend that the matter be referred to letter ballot for decision as to whether this hook should be continued as recommended practice of this Association, or abandoned. I would suggest that some action should be taken in reference to the adjustment of brake rigging, either by means of automatic devices or that rules be formulated which would insure closer adjustment and greater efficiency than is possible under present conditions.

To obviate the necessity of correcting bills, as well as to avoid the correcting of books in our Auditing Departments, I would recommend that a clause be inserted in the rules providing for the use of M. C. B. defect cards, for authority to counter-bill where errors may occur on bills. This system has been in operation on a number of railroads for some time, and results have been very satisfactory. I would also recommend that standard sizes for bill blanks be adopted.

The Secretary's report showed that during the year the net increase in active membership was seven members; eight railroads not heretofore represented have appointed representative members and at the present time the membership is as follows: Active members, 203; representative members, 189; associate members, 5; total, 457. The increase in the number of cars represented in the Association is 25,313. Since the last meeting, $9,700.40 has been received; the disbursements have amounted to $7,551.02, leaving a total balance in the treasury of $8,245.61. The annual dues for both classes of membership were made $4 for the coming year. The discussion of reports was next taken up, abstracts of which were given in our last issue. The report of the Committee on Supervision of Standards and Recommended Practice was acted upon in accordance with the recommendations of the Committee.

Triple Valve Tests.

Mr. Rhodes: The Committee on Triple Valve Tests has not prepared a written report. Its verbal report is that it has not been called upon to make any investigation on triple valves during the past year. The Committee has viewed this indifference of railroad managers and railroad men with, I may say, almost dismay. We are reaching practically the same condition that we were in prior to the practical tests inaugurated by this Association in 1886. At that time we had no specifications and no requirements for power brakes. When the committee of this Association commenced its work at that time, it was discovered, rather to the astonishment of the whole country, that there was not a brake in existence which was suitable for quick freight trains. A great deal of money was being spent in certain devices which the Committee proved beyond any question to be quite useless.

Now what is the condition to-day? Are we not taking precisely the same action that we took prior to 1886? Are not brakes being introduced to-day that have not been subjected to any practical tests, and is it a wise thing for this Association, in view of its past efforts, to let that thing go on? That is why the committee has considered whether it would not ask to be relieved from its responsibilities, and to have no committee rather than to have a committee which is merely a figurehead. This matter is going to become more and more important. As the various patents on these devices expire, there will be a greater tendency to get more of the devices into service, and it is going to be for the welfare of the railroads that they had a standard by which to measure them. We have such a standard in our rules now, and there is no reason why we should not know that certain triple valves meet these requirements.

Mr. Waitt: It seems to me that it is fully time that we take up the results of the tests which this committee has made and put ourselves on record as holding that the best practice would be for all railroads to accept and use only such triple valves as have been passed upon by the Committee on Tests, and found to be satisfactory, under our rules. I think it would be well if we could have as recommended practice those triple valves which have passed the test and these should be named specifically by catalogue number and maker's name. The moral effect of

this would go far to prevent the adoption of the cheapest thing to be bought when new cars are being furnished with air brakes.

Mr. Mitchell: I move that the standing committee on triple valves this year obtain triples from all manufacturers and make a test of them and report the results of their tests to this convention next year, giving specific names and referring to catalogue numbers so that we will know exactly what triples are working according to our requirements, and also those that are not.

Mr. Humphrey: I would move an amendment that the report be made and submitted to the Executive Committee as soon as practicable, and that it be printed and circulated among the members. Carried.

The original motion made by Mr. Mitchell, as just amended, was then adopted.

Standard Wheel and Track Gages.

Mr. Potter explained that because of the illness of the Chairman of the Committee, Mr. J. N. Barr, and because a suitable piece of track was not available for testing the relative resistance of cars on tracks of 4 ft. 8½ in. and 4 ft. 9 in. gage, no report could be made this year. The work, however, will be carried on during the coming year.

Brake Shoe Tests.

Mr. Bush stated that the committee had no formal report to make this year, as there were not enough really new brake shoes in the market to justify an extensive series of tests. Some tests will likely be made during the coming year. It was stated that the brake shoe testing machine has been moved from the Westinghouse Air Brake Works, Wilmerding, Pa., to Purdue University, and the terms of the agreement with the Purdue authorities will appear in the Proceedings.

Rust from Salt Water Drippings.

The committee recommended so piping refrigerator cars that the salt water drippings would fall between the rails. An abstract of this report was published last week. A few notes from the discussion follow:

Mr. Gibbs: How does the method outlined by the committee take care of bridges?

Mr. Higgins: The protection of bridges can better be provided for by a cheap covering on the bridge itself, rather than to attempt to keep the salt water from dripping on the bridge.

Mr. Waitt: Some three or four years ago our chief engineer made a very grievous complaint on account of the serious damage that was being done to the track on account of salt water drippings. I know that some of the refrigerator car owners are scouting the idea that much damage is done; but, notwithstanding that, it is a fact. There is serious damage done to new rails, and to the splice bars, especially. It is not possible to cover them with paint, as in the case of bridges.

Mr. Potter: I move that the device shown as No. 1 on the report of the committee be submitted to letter ballot as recommended practice. Carried.

The topical discussions were next taken up.

Lumber Specifications for Freight Cars.

Mr. Leeds' discussion was presented in printed form and we shall publish it in full in a later issue. The dimensions and quality of lumber suitable for freight cars were considered. A set of rules for the inspection of lumber for the mechanical department was given. He also recommended one size of sill, 4 in. x 10 in., for box, stock, long gondola and hopper bottom gondola cars, and greater thickness of sills in preference to greater depth, as the sills are weakened by the bolt holes. All siding and lining should be 3¼ in. face, and roofing 5¼ in. face. First-class yellow poplar was stated to be not only the best substitute for white pine, but fully equal to it for freight car siding. Standard dimensions were strongly recommended for all material entering into the construction of freight cars. Notes from the discussion follow:

Mr. Hayward: One of the troubles we are having in the interchange of cars arises from the fact that the dimensions of car material differ sometimes but slightly, and the consequence is we use such material as we have, possibly so close to the size that the difference is scarcely apparent, yet we find that the cars, after having been, as we considered, well repaired and very close to the standard of the company, will be rejected for wrong material, although practically safe in every respect. Again, a great many roads have their standard material on hand and have to cut that down at a loss to suit other cars, or they have to carry odd sizes. I think the subject demands wide discussion.

Mr. Higgins: I wish to say a word in favor of Norway pine for siding and lining of cars. The road I am with has used that for many years on all its box cars with very good results. Mr. Leeds neglected to speak of Norway pine in his discussion.

Mr. Leeds: I beg to correct myself; I did not intend to neglect Norway pine. I take it, however, that it is one of the white pine family, and included it as such.

Mr. Hennessey: The Chicago, Milwaukee & St. Paul road has been using a siding and roofing since 1890, which we think excels the average grade of pine which is in the market for siding or roofing. It is termed Douglass fir, or Oregon or Washington fir. It is of vertical grain, so that the grain goes directly through. We get no scales off it, such as you do with Norway pine. It holds paint well, and for lasting qualities is equal to any pine in the market. I do not think that the shrinkage is any greater than with yellow pine.

Mr. Appleyard: I want to indorse what Mr. Hennessey said in regard to Oregon fir. We use a considerable amount in freight and passenger cars and find it gives excellent results as to working qualities and strength. The lumber is lighter than pine and wears very well.

Mr. Small: I want to refer to California red wood for siding and roofing. Red wood is among the standard woods of the country. I trust if any of the members find red wood on the ends of their cars that they will not send us a bill for wrong material.

The Present M. C. B. Journal Box Stop Wedges, Brasses and Lids.

Mr. H. F. Ball: The top surface of the present M. C. B. key is in the shape of a cylindrical segment, the radius of the curve being 78 in. When the journal box is in its normal position, it is in contact with the key as its center, and load which it supports is distributed uniformly lengthwise of the journal. Any necessary adjustment between the box, key and brass by reason of truck imperfections, is obtained by a rocking motion of the box on top of the key. It follows that an adjustment obtained in this way necessarily implies an eccentricity of bearing between the box and key, resulting in increasing the unit of pressure at one end of the journal, and to such an extent at times as to seriously interfere with proper lubrication.

In the examination of trucks that have been in service for some time it will be noticed that a large percentage of the boxes are inclined out of the vertical. In most cases it will be found that the tendency of the box is to incline outwardly at the bottom, throwing the load toward the rear of the journal.

In pedestal type of trucks this condition is very noticeable from the excessive wear which takes place between the pedestals and box guides at top of box. A further evidence of the want of uniformity in the distribution of the load is seen in the unevenly worn bearings which are removed from time to time. It is well known that the rear end of the journal is the most difficult part of the journal to keep properly lubricated, owing to the tendency of the packing to shift out of position, and also to the amount of grit and sand that is carried in the rear of the box. Add to these obstacles to proper lubrication the excessive bearing pressure at the rear end of brass, and we have a combination at work that sooner or later gives the inspector an opportunity to send in a report of a hot box, resulting from a "doubtful" cause.

What is desired is a key or brass that will adjust itself to the inequalities of the truck, and at the same time maintain a uniform distribution of the load lengthwise of the journal. This condition cannot be obtained with the use of the present M. C. B. standard key.

Air Brake Testing Plant.

Mr. H. F. Ball: At the eastern terminus of the L. S. & M. S., an air brake testing plant, suitable for taking care of a large number of cars, which it is intended the yard will handle, was recently installed. A brief description of this plant follows:

Air is furnished by a duplex compressor having 8 x 8 in. steam cylinders, and 4¼ x 8 in. air cylinders. Air is compressed into a storage tank of 100 cu. ft. capacity, located in the open air and within 30 ft. of the compressor. A 2-in. main feed pipe conveys the air from top of storage tank to a point opposite the repair yard, from which point branch feed pipes 1½ in. in diameter convey the air to the branch lines on the repair and inspection tracks.

Four branch lines of 1¼-in. pipe, having connections spaced 50 ft. apart, complete the equipment for six repair tracks. The branch lines are located midway between the tracks, pipes and connections being secured in place on top of the planking.

In the inspection yard 14 inspection tracks are taken care of by seven branch lines of 1¼-in. pipe. Each line of pipe furnishes air for two tracks. It is laid on top of ties as close to the rail as practicable, and is held in place by ⅜-in. wrought staples driven into the ties. Connections, consisting of 1-in. Westinghouse couplings threaded at one end and screwed into 1-in. cutout-cocks and connected to tees in line pipe by 2¼-in. nipples, are located at distance of 100 ft. apart. Each connection is inclosed in a box-shaped casting, the top and end of which are hinged and pivoted, forming a lid. The box is secured to the tie by screws. On each side of the box a wooden fender, of wedge shape, is provided for the safety of switchmen and others working in the yard. These fenders are of oak, and securely nailed to the ties on which they rest. A blue print showing connection, box and fenders, with detail dimensions, is presented herewith.

An expansion arrangement is provided every 300 ft. This consists of two short sections of 1¼-in. air brake hose connected together at one end by hose nipples, elbows and a union, and the opposite ends connected with the line pipe by hose nipples and elbows, the whole forming a U bend in the line. The expansion arrangements are inclosed in a manner similar to the hose connections.

All pipe used in the plant is extra heavy galvanized pipe.

At the junction of the branch feed pipes with the branch lines on the inspection and repair tracks, valves are provided, so that in case of necessity any one of the branch lines may be cut out and not interfere with the working of the remainder of the plant.

The location of pipe on top of ties close to rail, and the detail arrangement of hose connections above described, would seem to commend themselves from the standpoint of economy in cost of installation, also in cost of maintenance. No trouble can be experienced with water lying in box and freezing, it being drained off as rapidly as it enters the box. The length of connection box being not over 18 in. from rail, and having tapered fenders on each side, presents very little obstruction to switchmen to stumble over. In the event of repairs to track the work can be done without interfering to any extent with the pipe line.

In the plant above described we have about 23,000 ft. of pipe, the storage capacity of which represents approximately 2,700 cu. ft.

The inspection tracks are provided with 206 connections. A plant of the above description, with connections, boxes, etc., located as described, can be installed for about 15 cents per running foot. This is exclusive of compressor and storage tanks.

Mr. Bush: I recently made some investigations covering the present conditions of air brakes. It bears indirectly on this question and shows the necessity of something comprehensive for taking care of brakes. Taking a lot of air-brake cars, in over 50 the air-brakes were in such a deplorable condition owing to lack of care, that the service application could not be obtained at all, except with the maximum reduction. In a great many cases service application could not be obtained at all; only the emergency application. The condition was found to be much worse than I expected.

Mr. Hatswell: We have an air-brake testing plant of this description with three compressors at different shops. We also use this air for other purposes, such as cleaning coaches, changing car wheels, hoisting car bodies, and also for use with our drilling machines. Where we have our air-brake valve for testing air brakes we put on a reducing valve to carry the working pressure of an air-brake. Say we are carrying 100 lbs. of air when we are using it for other purposes, when we test our air-brakes through the reducing valve we average 65 lbs.

Standard Truck for 60,000-Lb., 80,000-Lb. and 100,000-Lb. Capacity Cars.

Mr. Bronner reviewed the work of the M. C. B. Association in the past, having as an object the adoption of a standard freight car truck. He draws the conclusion, from the fact that the design for 80,000 lb. arch bars was adopted, and that for 60,000 lb. arch bars was rejected, that the easiest time to adopt standard designs is a little in advance of the times, where the design is merely an enlargement of well-known practice. As to the practicability of now adopting a standard truck, he said:

First—Judging from past experience, I should say that we cannot agree on a standard, and even if we were to adopt a recommended practice it would not be largely used.

Second—A standard adopted and fully recognized would impede progress.

Third—It would amount to very little in the end, as the practical results sought could be largely accomplished by the adoption of standard parts.

To determine what the parts are that fail largely, I have analyzed the truck repairs on our road for one month. These are the running repairs made at outside repair stations, and do not include heavy repair at shops. The total number of cars receiving repairs of any kind was 9,864.

The truck repairs were divided as follows:

Wheels and axles (including journal bearings in a majority of cases)	825
Journal bearings only	988
Journal bearings, wedge	57
Journal box bolts (about 72 per cent. alone)	317
Truck column bolts	173
Truck column guide bolts	163
Arch bars	86
Tie bars	4
Swing hanger pivot casting bolts	2
Bolts in Fox truck (jaw)	2
Swing hammer	31
Swing hanger pivot	17
Center pins	273
Truck truss rods	39
Journal box	42
Journal box covers	14
Truck column	27
Bolster guide block	20
Swing hanger pivot casting	25
Swing hanger casting	4
Spring plank casting	8
Truck bolster chafing plate	3
Truck bolster	34
Truck transom	15
Spring plank	25
Truck springs	40
Nuts without number	
Total	3,234

It will be seen that a large percentage of the repairs is on account of wheels and axles, journal bearings, journal boxes and covers, journal bearing wedges and journal box bolts. These we have standardized for several classes of trucks, and if they were adopted and used by all our members it would obviate much of the difficulty in making truck repairs. On the whole, I shall say, let us give up "rainbow chasing" and save the time and labor spent in trying to adopt standard trucks.

If we can get standard wheels and axles, journal bearings and wedges, journal boxes (which determine their bolts) and possibly standard cross sections for arch bars and diameter of common bolts for 60,000, 80,000 and 100,000-lb. trucks, we will get all we can ever hope to compromise on in the present stage of the car builder's art, and practically all that will be necessary.

A great many designs for metal freight car trucks have been brought out, but my experience has been limited to two general classes—the type represented by the Fox, Cloud, Schoen and Hewitt trucks and the variations of the old diamond type of truck brought about by the introduction of metal trucks. The relative efficiency of those of the first type as compared with each other would be a difficult mater to determine, and not having any data upon which to base a conclusion, I will leave the point for discussion by others who may feel themselves more competent or may have had the trucks under their observation.

With both kinds of trucks the function performed is to sustain the weight on the center and distribute it to the journal boxes. The trucks must do this over good surface and bad surface, over curves and tangents, at low speed and at high speed. To do this efficiently the truck must retain its shape in all respects under the shocks and strains it is subjected to. It must remain square to keep the flange wear of the wheels and the train resistance at a minmum. The cross girders or bolsters must show little deflection so that too much weight will not be thrown on to the side bearings, and thus increase the resistance to curvature. The transverse strength of the cross girders, transoms or bolsters must be sufficient to resist the shocks of sudden applications of the brakes and buffing. The wheel shock must be cushioned in a manner to produce the least detrimental effect on the structure of the truck or body and also the track. It should be of such design, construction and material that failure of parts will be reduced to a minimum. Failure in detail increases cost of maintenance and decreases safety. It should not have too many vital parts which might, by the failure of any one, wreck the truck, the car or the train.

We must also consider the facility and ease of inspection and repairs or replacements of parts subject to wear. The modern diamond frame truck, either rigid or swing motion, constructed entirely of metal, more nearly meets these requirements than its predecessor constructed largely of wood and with gray iron castings. The metal bolsters and channels are more rigid and less liable to sagging, decay and failure. The introduction of malleable iron parts has also resulted in a decrease of failure of those parts. But let us examine the repair records and see what are the weaknesses of the diamond truck, and whether these improvements would eliminate them. We find that the various wrought iron parts and bolts still remain, that the truck still depends upon too many vital parts, that it is still subject to failure in detail.

It might be said that the larger and heavier parts in the modern trucks will resist more effectually the shock and strains that they are subject to. In this conclusion I think that we would be largely in error, as there have been many well-designed trucks under our older and smaller capacity cars, which were fully as good for their class, barring the metal bolster, as the trucks under our large capacity cars. The latter are merely an enlargement to meet the greater carrying capacity of the cars and still embody all the vital parts and probably most of their weaknesses. These parts are failing as in the past, and these failures will increase as the cars get older and the carrying capacity greater.

The diamond frame type of truck was a better type for small capacity cars than it will be for 60,000, 80,000 of 100,000-lb. capacity cars. The frame is still subjected to all the wheel shock uncushioned and the strains induced by trying to force four wheels held in a rigid frame into contact with rail surfaces not lying in a plane. With our 60,000 and 80,000 lb. trucks, we retain the same wheel base as in our lighter trucks, but enlarge and stiffen the parts to carry the increased load, thus robbing them of a certain amount of elasticity which the lighter trucks possessed; otherwise, I am unable to understand the large number of failures of arch bars in diamond trucks of large capacity and heavy parts which I have noted. In the matter of inspection it is true that the arch bar truck permits an easier inspection of wheels than a plate truck, but the frame of a plate truck having so few vital parts, and being subject to so few failures, requires less time for inspectors and permits more time to be devoted to the wheels.

In the matter of repairs, the replacement of wheels requires more time in a truck with jaws than in the diamond truck, even considering the time consumed in handling inside wheels and rusty box bolts, but in weighing the matter we must remember the length of life of wheels in freight service.

From my point of view, a plate truck of the type represented by the Fox, Cloud and Hewitt trucks is the most efficient truck for cars of large capacity. Properly designed and built in a proper manner with the right material, they will retain their shape in service, thus reducing train resistance and flange wear. The cushioning of the entire structure above the journal boxes decreases cost of maintenance.

To come down to practical facts, the road I am connected with owns but fifty cars equipped with Fox trucks, but we handle N. Y. C., Erie and L. V. cars equipped with these trucks in large numbers, so that our men are perfectly familiar with them. The only failures that have occurred on our lines were two cases when the trucks first came out. The side girders failed, beginning with a fracture at the bottom flange, near the cross girder, and passing up through the rivet holes. It developed gradually. Since then we have had practically no running repairs to frames whatever on the many thousands of these trucks which we have handled. Our foremen all report satisfactory service for all such trucks coming under their observation. We know that the earlier designs developed some weakness and have been changed once or twice, and, for all I know, when they get home to the owners they may be like the "old one hoss shay" and break down all at once, but we have never seen anything of it. The type of truck is what I am referring to, although in talking of my practical experience with the type I am obliged to handle a particular one. It may be that none of the trucks of that type now in service are just right, but I firmly believe that the most efficient truck for the service lies along those lines, and that it can be built to last.

The body bolster is fully of as much importance as the truck bolster, although more attention has been centered in the latter. It is of little benefit to get a rigid truck bolster if your body bolster sags and permits too much weight to be carried on the side bearings, as side bearings are generally constructed. Go through any railroad yard and what do you see? Body bolsters all sagged at the ends, especially the wooden ones. A wooden body bolster can no more be preserved in line in practical service than a wooden truck bolster can.

Mr. Mitchell: I have some information that may be of use to the members as to the cost of the metal truck. We commenced to use one type of truck, the Fox, in 1891. We have 8,000 cars equipped with this truck. The trucks were bought subject to a guarantee. Outside of the trucks that were condemned on account of poor metal, we have broken in wrecks eighty trucks. Out of these eighty, twenty-two were returned to the makers for repairs. The cost of the repairs by the makers was on an average $28.21 each. The average cost of the repairs to the forty-eight trucks which we repaired was $5.32 each. The average cost of repairs of all these eighty trucks, including those returned to the makers, and those which failed on other accounts, was $15.09. This does not include trucks returned, failing on account of poor metal. The average age of the trucks is 3½ years.

Thursday Morning.

President Crone called the meeting to order at 9:15 a. m.

The Secretary: The Executive Committee has instructed that this letter be read to the Convention. It is from Mr. R. M. Galbraith, General Master Mechanic of the St. Louis and Southwestern Railway Company. The letter from Mr. Galbraith called attention to the desirability of having stenciled upon cars their light weight, with reference especially to the cars of private lines. It refers to the fact that engines are being rated on the tonnage basis largely, and proposes that this matter should receive some consideration.

Mr. Mitchell: It seems to me that all cars should have the light weight stenciled upon them, and I make a motion that a committee of five be appointed to confer with the private lines and report to-morrow on this subject; said committee should have upon it at least two private line members. Carried.

The President appointed as the committee on the light weight stencilling of cars Messrs. A. E. Mitchell, F. H. Stark, S. P. Bush, F. E. Parker and H. A. Bowen.

Conference with Auditors.

Mr. Rhodes: The committee recommends that the report be accepted and spread on the minutes, and that a copy be transmitted to the Railway Accountants' Association with the statement that while the M. C. B. Association is in sympathy with the general intent of the recommendations, it does not feel that the M. C. B. Association is the channel through which the recommendations one, two and three of the report can be enforced. Recommendation four can be cared for by the M. C. B. Association. The report of the committee was accepted, and the committee discharged.

Trains Parting.

The Committee had not sent any report to the Secretary.

Mr. Rhodes—Many of the members of the Association had looked upon this subject with a great deal of interest and had hoped to have a report, and it seems to me a very pertinent question. Why is there no report? There is an undercurrent of feeling among our members that there is hardly a more important subject to be dealt with by railroads. I have been surprised to see the sort of blind confidence that is connected with the subject of couplings between cars. No one questions the character of the coupling or the kind of material that is put into it, but it seems to me that some one must have confidence that some people are looking after it, and I believe that this sort of blind confidence is in our Association. I believe that up to the present time it has been thought that it was not necessary to describe the material and mechanism of the coupling, because our Association has done such good work in the past that the public believe we will continue to do so. This is quite a gratifying condition to reach, and I do hope we will continue to merit it. I have recently seen, in my part of country, a M. C. B. bar put in service made of cast iron—the bar itself—and not the knuckle. I do not hesitate to say that any railroad or manufacturing company which will put M. C. B. cast-iron bars into service, and loss of life results, has committed a criminal act. I propose, for one, if anything of that kind is discovered on the equipment of cars passing over our road, to make it as prominent as possible. I think that is what we should do as members of the M. C. B. Association. If anybody, through ignorance or any other cause, attempts to put material on the cars which is not suited for the purpose, which pass all over the lines of this country, we must make prominent that negligence and that criminal indifference to the safety of railroads, trainmen and passengers on our lines.

Now, let us ask what we can do in this respect. In the first place, a movement has been made at this meeting for specifications for drawbars and couplers. Now let us all get at that with some intention of having some kind of a specification. Let us ask ourselves: How can we have a specification for wheels and specifications for axles and at the same time have no specification for a coupler?

I would urge upon this Association that when drawbars are sent to be tested or tried on a railroad they be given a thorough test. I believe it is the practice of a good many roads to accept the bars and to put them into service. The first thing members should do when they receive a half dozen bars for testing, is to put them under the drop test and see what material they are made of. Never put an M. C. B. bar in service of which you have no experience without putting it under the drop test. Keep a record of every break-in-two that occurs. It is important. When a car parts, find out which knuckle is open and get the name of the coupler and keep a record of it, and if they part without either knuckle opening, that is a matter also of which a record should be kept, as there may be conditions of wear or construction which would permit it to open. When we have done that, generally we will finally know the couplers which cause break-in-twos, the kind of draft rigging that causes break-in-twos, and in following this case up we will have material aid in knowing what is the best kind of coupler to use, and the best kind of attachments to use; and I would urge the members of the Association to follow this thing up closely.

Mr. Waitt: I know from my own experience in investigating the subject last year, that information was obtained which was made use of on the Lake Shore and has quite materially reduced the number of break-in-twos. Many cases of break-in-twos were discovered and were enumerated in a report, and these causes have in many cases been removed. It seems to me that as the Association has found it wise to have a permanent committee on triple valve tests, permanent committee on brake shoe tests, that right in line with that it seems to me the subject of couplers would come in for permanent committee work, and I would like to see a standing committee of the Association appointed and take this subject up and consider it in its broadest sense.

During the past year I think it is safe to say that many of the coupler companies have carried out some of the suggestions made by the committee on train parting last year, and have made improvements in couplers and avoided some of the weaker points that were at times causing trains to part. The question is asked whether it is necessary to have any additional device in order to prevent trains parting. We know that one of the sources of trains parting in some couplers is on account of some sort of gripping action that raises the lock and lets the knuckle open. That evidently must be caused by the cars not being kept at a uniform distance apart, sometimes slacking up and sometimes pulling apart. With our heavier capacity cars it seems to be a proper question whether or no we have need to make some provision to keep the cars steady and keep them from having the lateral and longitudinal motion that they now have by means somewhat similar to what we have in our passenger trains and find necessary to have there, and our consideration was given last year and is still being given to the use of some sort of buffing device, something to keep the cars where they should be and preventing the breaking of couplers by the unusual shocks in switching. As the capacity of the cars is increased and the length of trains increased, we must consider this matter very seriously.

There is one point especially which I think must be given attention to this coming year, and, in fact, right along, and that is in deciding on some limit for permissible wear in the couplers. On many roads which are equipped with the automatic couplers, the couplers will come apart without unlocking, due to the parts being worn.

The discussion of the rules of interchange followed at this point, and the recommendations of the committee were generally adopted.

A live discussion was had of the question of allowing the railroads west of the 105th meridian 15 per cent. additional compensation for car repairs. The whole matter was finally referred to a special committee to report next year, the committee to consist of three members connected with the railroads representing respectively the west, middle and eastern sections of the country, and two members connected with private car lines.

Friday.

President Crone called the meeting to order at 9:15 a. m.

Stencilling Cars.

The committee on stencilling the light weight on refrigerator line cars submited a report. On account of several of the refrigerator line representatives knowing that their companies object to having weights stencilled on their cars, and preferring to confer with their superior officers before deciding this question, we recommend that a committee be appointed on this subject to report at our next convention, before which time the subject can be fully ventilated; the report was accepted and referred to the Executive Committee.

Care of Journal Boxes.

This report was printed in our last issue. Mr. Mitchell moved that it be adopted.

Mr. Waitt: It is said that the average number of hot boxes per thousand miles is 2½. It seems as if that was a very high average of hot boxes and as if there was an opportunity for radical reform somewhere, as I do not believe on the average of roads that there is any justification for running cars with anything like that in the way of an average of hot boxes. I looked up the record on the Lake Shore. From the reports of 1897, we average one hot box for every 70,000 miles run. This was on passenger equipment. On freight equipment, with equal care, we had only one hot box in every 20,000 miles run. That result was not obtained without care. Were it not for the foreign cars running over the line which had not received proper care on the home lines, the mileage to a hot box would have been more than four times what it was. On the reports that come in on freight cars, 80% wer on foreign cars, and 20% on our own cars. I do not think we can have good results in running our journals unless we keep the dust out of the oil boxes. The committee has recommended excluding the dust from the front end of the box, and yet they seem to think that a common wooden dust guard, cut, as most of them are, from $\frac{1}{16}$ to $\frac{1}{8}$ in. larger than the part of the axle where they fit, will be satisfactory. You will find the waste in the oil box dirtier at the back end then you do at the front end. I would not publicly advocate any one dust guard to the exclusion of another. If some of the gentlemen who have in their answers advocated the wooden dust guard had experimented with other devices, they would find some advantages over the plain wooden dust guard.

We find that it is essential as winter comes on that all of the lighter summer oils be removed from the waste.

An excessive number of hot boxes in cold weather seems to come right after a thaw, and last winter some investigation was made into the cause of that, and it was found that after the weather had begun to be moderate, when we would open the oil box covers, there would be a collection of water inside of the oil box, and in proportion to the amount of water that seemed to be in there—I suppose the condensation of the atmosphere—seemed to be the lack of lubrication of the journals and increase of hot boxes. That was overcome by more frequent withdrawal of the packing and removing of the moisture. On some of the fast trains it had been found a wise practice, whenever there has been a moderation in the temperature after severely cold weather, to make sure, before these trains go out, that all of the water has been removed

from the waste, and this practice has stopped the annoyance from hot boxes on such trains.

Mr. Mitchell: I would ask Mr. Waitt what they call a hot box.

Mr. Waitt: Anything that causes a delay to train or requires the box to be repacked or a new brass put in.

Mr. Mitchell: Possibly the large percentage of hot boxes stated in the report may be caused by other railroads which practice our methods. With us every box which is hand warm is a hot box, and the inspector raises the lid. It is reported as a hot box, but has not given any trouble, and possibly might not give any trouble for a hundred miles further.

Mr. Brazier: On the Illinois Central we report hot boxes only where they cause delay to trains. It is almost unknown with us to have a hot box on passenger cars, except with the Pullman cars. I do not think last year we had thirty passenger cars delayed over our entire system caused by hot boxes. We attribute this result to the system of oiling and packing the boxes. We do not have an oiler. We use the saturated waste and make the men go with the hooks and lay the waste up around the journals. Putting oil on a journal does not amount to anything; but if attention is paid to the packing and it is well soaked, there will be fewer hot boxes. I think we have cut down our oil consumption on the Illinois Central out of Chicago almost one-third, and hot boxes fully 50 per cent.

We are trying at the present time two or three patent dustguards. With one of them the mileage has been 30,000 or 40,000 miles, and two quarts of oil have not yet been used. The front is put on with bolts, and no one can get at it. It is making a remarkable record. Some of the new dustguards which are offered would ruin a corporation to purchase them, one selling for 62 cents. Our dust guard costs us two and one-half cents.

Mr. Mendenhall: The remarks which have been made undoubtedly refer to the wooden guard, as used with a slot closed at the bottom. If we could spend 62 cents each for a dust guard, we could get an efficient dust guard; but we can do it easier. If you will core your dust guard slightly at the bottom, parting your wooden dust guard, driving one section up from the bottom and the other section down from the top, with a good driving fit, you will have a tight dust guard and undoubtedly find a great surprise in store for you by using such a device.

Mr. Schroyer: We know on the Northwestern something about hot boxes, and we know a good many things we do not want to tell. I am of the opinion that we are too contracted in the construction of our oil boxes, and especially as far as the dust guard space is concerned.

Woolen waste does not absorb the oil as cotton waste does. Cotton is a better absorbent and carries up the oil better than the woolen waste. The reason that we used woolen waste with the passenger service was that the cotton waste was stolen to such an extent by the trainmen that we had to use woolen waste as a matter of self protection. When the cars are in the repair yards, we remove the waste from the journals. It is taken to the assorting room, where we have pneumatic presses. We have large vats in which the waste is saturated. It is kept in these vats for weeks before it is used. We squeeze the oil out, and the waste is assorted there, the Babbitt and brass taken out of it, the best of it put into service again, and that which is very bad is sent to the locomotive department for starting fires. We get enough oil out of the old waste to pay fivefold for the work.

We think it is more essential to change the oil in the spring. The winter oil in summer gets thin as water, and it flows to the bottom. I think it is more important to change the waste in the spring than in the fall. We do not make a practice of changing waste at any time, but make it a practice of giving the boxes attention in the spring, and more especially during the summer season, when ballasting is being done.

Mr. Leeds: On one of our divisions in the hot weather the sand will pile up on the brake beams from 1 in. to 1¼ in. deep every trip. It is as fine and sharp as emery. We cannot run a set of axles one-third as long there as on any other division. The journals always look as white and bright as though you were using dry emery cloth on them, and the wheels will not run half as long as they do on other divisions, and yet we never have any hot boxes on that division. That is the only place on the road where the hot, dry, dusty season does not produce hot boxes. In my opinion one-half of the trouble comes from lumps in our castings in the inside of our boxes; the box not being bored true to the angle and dimensions given, either in the brasses or in the box, and any inequality there is bound to cause trouble.

Mr. Lyon: In regard to the statement that the average number of hot boxes per thousand miles is 2½, it seems to me that that is not right. They must mean car miles. Does that include all classes of equipment?

Mr. Bush: Mr. Schroyer's remarks are very pertinent, indeed. He points out the very contracted space for applying the oil. It is impossible to get the spout of an oil can back to the rear of the journal, and on a great majority of the railroads where the oil is used, the oil is just put in at the front and does not get back to the rear of the journal.

"Square Bolt Heads and Nuts; Standard for Pipe Fittings."—Mr. Schroyer, Chairman of the committee, read the report, which was received, and the committee continued until next year.

"Specifications for Air Brake Hose."—Mr. Waitt gave an extended explanation of the method of treating material in the manufacture of hose, and accompanied his remarks with a statement of the results of tests made. Great applause followed the conclusion of the explanation.

"Springs for Freight Car Trucks."

Mr. Mitchell: Has the schedule been submitted to the spring makers to demonstrate whether the weights given for the capacity of springs and weights of the coil are correct.

Mr. Lentz: I obtained sets of the coils and had them tested at our shops so that the weights as given are correct.

Mr. Waitt: Where the schedule of capacities is given, in the case of 60,000 pound capacity cars, the capacity of the springs in pounds in the arch bar group is 18,600 pounds. Four groups of that kind to a car would be 74,400 pounds. You will notice for the same capacity car in the case of the pedestal trucks each spring has a capacity of 12,500, and eight springs would be 100,000 pounds. In other words, they give a capacity of springs according to the schedule, of 25,000 pounds per car more for pedestal trucks than for arch bar trucks. The same things holds good in the 70,000 pound cars. The capacity of springs for the pedestal type amounts to 128,000 pounds, and for the arch bar truck only 100,000 pounds. In the case of the 80,000 pounds capacity car, they have it nearer; 136,000 pounds for the pedestal type, and 128,000 for the arch bar type. If we are going to adopt this report as recommended practice, it would be inconsistent to recommend such a vast difference in the capacity of the springs for the two types of trucks.

Mr. Bush read the report. (See last issue of the Railroad Gazette.)

The report was received with no discussion.

"Revision of Air Brake and Signal Instructions."—Mr. Rhodes read the report.

Mr. Waitt: I move that the report be received, and that the air brake and signal instructions as revised, be submitted to letter ballot. Carried.

"Steel Car Framing."—Mr. A. F. Mitchell, chairman, said:

This report is simply historical, to guide the members in the future as to what has been done in steel car framing in the past. I would recommend that the committee be discharged and the subject taken up again three or four years hence, when we shall know more about it.

Mr. Morris: I move that the report be accepted and the committee discharged.

Mr. Simons: I believe that the committee can be of a great deal of service to the association if it is continued, and obtains such information as is possible from year to year, and reports to the association. The most important question in connection with these cars is the body bolster and the draft gearing, and if the committee is continued I trust they will give especial attention to these important features. We have in use on the steel cars to-day a draft gear which is made up of lugs riveted to the center beam, and in these pockets we place all draft springs side by side, of 26,000 pounds capacity. Still, we find the horn of the coupler is striking the face plate on the sill. In a test made a week ago last Monday with a dynamometer car we found in a train of 2,156 tons we had a pull on the draw bar a trifle over 35,000 pounds on a 22-foot grade. We were 9,000 pounds over the capacity of our draft springs. My impression is that we must get away from the present draft arrangement when we are using heavy capacity cars.

Mr. Mitchell: Mr. Simonds is one of the men who did not give us any information. I would suggest if you are going to have a committee on this subject next year, the men who operate these steel cars are the men you want on the committee.

Mr. Morris's motion was then put and carried.

"Passenger Car Pedestal and Journal Box for Journal 4¼ by 8 inches."—Mr. G. W. West, Chairman, presented the report, which was received.

Mr. Mendenhall: I move that the recommendations of the committee be submitted to letter ballot.

Mr. Waitt pointed out some slight errors of detail in the drawings, and moved that the committee be instructed to make the correction of these dimensions, and put in necessary dimensions, so that patterns could be made correctly, before the recommendation was submitted to letter ballot.

Mr. Mendenhall's motion, with which were incorporated the suggestions of Mr. Waitt, was then put to vote and carried.

Committee on Prices.—It was recommended that the prices for all makes of M. C. B. couplers complete be $7.50, and that all individual parts except the shank be billed at 3½ cents per pound. The shank to be charged for at $4.50; 75 per cent. of price for new parts to be credited for all good parts removed; and scrap credited for broken parts renewed at rates given in table of Rule 5.

It was also recommended that the Secretary of the Association obtain the correct weights of the parts of the different couplers and notify all members by circular prior to Sept. 1, 1898.

The following prices were recommended for axles of 80,000 and 100,000 pounds capacity: 80,000 pounds, new, $12; second hand, $7.20; scrap, $4.80. One hundred thousand pounds, new, $14; second hand, $8.40; scrap, $5.60.

The following prices were recommended for trucks of 60,000 pounds capacity or under: With wooden bolster, $175; 60,000 pounds capacity or under, of metal, $230; 80,000 pounds capacity, of wood, $255; 100,000 pounds capacity, of metal, $280. The report was received and prices accepted.

Mr. Mitchell: I move that the report of the committee be received, and that the prices given by the committee be accepted as the basis for making charges for the coming year.

Mr. Leeds brought up the question of rules governing the loading of lumber and timber on open cars, and requested that certain modifications be made thereto. He presented a printed pamphlet containing the modifications desired by members of the original committee of the Association.

Mr. Waitt: In line with the recommendation of Mr. Leeds, I make the following motion: That the Executive Committee be instructed to appoint a committee after the close of this convention to take up the matter of the revision of these rules, consider all the papers that the Committee on Standards can turn over to them, and confer with a similar committee to be appointed by the American Railway Association: the committee to report to the Executive Committee, and their result of the report to be made known to the members of the Association as early in the year as possible. Carried

Topical Discussions.

Side Bearings—A consideration of the increased resistance of cars, due to a large amount of the weight being carried on side bearings, and the best means for overcoming this difficulty.

Mr. Mitchell: In November, 1897, we made a test with a dynamometer car on two trains, one of which weighed 2,115 tons and the other 2,114 tons, a difference of only one ton. The percentage of cars equipped with Fox trucks and metal body bolsters in one train was 100 per cent., all of which were centre bearing. The other train was composed of diamond trucks and wooden body bolsters, only 12 per cent. of which were centre bearing. There was no wind blowing and both days on which the tests were made were as nearly alike as possible. The makeup of the trains was as follows: Number of cars in the first train, 22; in the second, 23; number of loaded cars in the first train, 21; in the second train, 22; number of empty cars in each train, 1. Length of first train 834 feet, length of second train 866 feet. Average drawbar pull, pounds per ton, in first train 12.83, in second train 13.89, or 7.6 per cent. decrease in favor of first train. The average speed, miles per hour, first train 11.97, second train 11.13, an increase in favor of the first train of 7.5 per cent. The average boiler pressure, pounds per square inch, first train, 128.7; second train 127.03, or an increase in favor of the first train of 1.1 pounds. The average reverse lever position, number of notch in the first train 10.17; second train 9.3, or an increase in favor of the first train of 9.3 per cent. The average coal burned per hour of actual running time, in pounds, first train, 2915.4; second train 3177.5, a decrease in favor of the first train of 8.3 per cent. The average coal, per ton to the train in pounds, first train 5.676, second train 8.038, or a decrease in favor of the first train of 29.4. These figures show you the enormous saving which can be made if the cars are all centre bearing.

Air Brake Details for Freight Cars.—A consideration of the advisability of securing uniformity in details of air brakes on all classes of cars, and the possibility of adopting standard forms for piping; also a consideration of better designs of piping, whereby all elbows would be omitted and bends of large radius substituted.

Mr. Humphrey: It is important we should adopt a standard for the application of air brake appliances so that the equipment could be more uniformly used throughout this country. I believe that there are abuses arising from the inferior material which is being used in these appliances. I believe that the members would be astonished if they knew the troubles experienced on Western roads in keeping the air brake attachments intact. Just before coming to the convention I had the inspectors at one point keep a record of a little over 1,500 cars and test the retaining valves to see how many of them were really effective out of 1,500. There were 137 retaining valves that would retain the pressure to exceed three minutes. These cars were taken promiscuously from different roads, and there was not 10 per cent. on which the retaining valves were of any value whatever, and they might as well have been off the cars as on them. I hope that there will be a committee appointed to go into this matter in detail and report a standard at the next convention, so as to do away with as many of the joints as possible in the train pipes.

Axles.—(a.) Design of axle for cars of 100,000 pounds capacity. (b.) Revision of the design of axle for cars of 60,000 pounds capacity.

A long written discussion on this subject by Mr. E. D. Nelson will be given in a later issue.

Height of Drawbars.—Owing to the fact that within a comparatively short time all of the freight cars in the country will be equipped with Master Car Builders' couplers, should not the present limits for height of drawbars be modified?

Mr. Schroyer: There is no necessity to go between the cars when automatic couplers are used. I am of the opinion that the limit of three inches now allowed by law may safely be increased without in any way increasing the element of danger to life or limb in handling the cars.

I believe you are all familiar with the troubles, delays and expense now occasioned in maintaining the heights required. This is due to the amount of wear the wheels, journals and brasses are subject to. The additional lowering due to set of springs both permanent and under the load, the shrinkage of sills and draught timbers, the loosening of bolts and nuts, the bending of carrier irons, the manner of trimming load, etc., all affect the draft line to such an extent as to lower it below the minimum of cars built to 34½ in., thus necessitating their raising within a very short time. This in many cases must be done in a makeshift manner, unless construction is such as to enable change to be made without blocking.

Natural wear of parts, shrinkage of timber, set of springs is so great that cars in service two or three years require raising.

The face of the knuckle will average in width about nine inches. When two cars are coupled together, one of which is the minimum height under the load, the other the maximum height empty, there still remains six inches of contact between the knuckles. The variation in the minimum and maximum height of draught lines may be safely increased from three to four and one-half inches, when we have yet remaining four and one-half inches of contact, when a car of minimum height is coupled to one of maximum. I think that this will be ample for all purposes in the safe handling of trains.

I know of no trouble being occasioned by variations of four and one-half inches, and believe that automatic bars as constructed to-day will permit of a safe variation of the amount mentioned above when all cars in service are so equipped.

Mr. Schroyer: I have said nothing as regards the heights of drawbars or the percentage of drawbars, the lines of which are above the maximum or below the minimum. We have found much difficulty in getting cars of the proper height. We have furnished drawings to one manufacturing concern, and when the car was completed the draft line was just right, 34½ inches. In the case of another company, the draft line was nearly three-fourths of an inch above. The discrepancy was brought about by one-eighth of an inch here and one-sixteenth of an inch there, and these small deficiencies are difficult to overcome in the construction of a car. I wish it could be found possible to have the limits increased from three to four and one-half inches.

Mr. Rhodes: I believe we should proceed with this matter cautiously. When these limits were recommended, we endeavored to get them as wide apart as they safely could go. First, we wanted five inches, then four, then three and one-half, and finally our data showed that three inches was at the present time the only safe limit we could go to. If you have a greater variation than three inches, you will find conditions where you will only find two of the lugs of the knuckle coupled together, and that is not safe. From the data given, it might appear that the two lugs might be coupled together, but if you will measure the knuckles that render service, you will find that three inches is the widest variation that we can have safely now, until the link and pin is done away with entirely.

Mr. Morris: I notice the reference in the address of the President to the subject, and I therefore move that the suggestions of the President on this subject be referred to the Executive Committee, and that the committee confer with the Interstate Commerce Commission or the American Railway Association as it thinks best on this matter, and report. Carried.

Triple Valves.—The best practice for the proper maintenance of triple valves.

Mr. Rhodes: Section 21 of Rule 3 says that owners are responsible for defects in "cylinder or triple valve of air-brake cars not cleaned and oiled within 12 months, and the date of the last cleaning and oiling marked on the brake cylinder with white paint." We have 16,800 cars fitted with the air brakes, and to go over these within the time required by the rules we must clean 14,000 triples and cylinders a month. Since we started to keep a record we find that we are not getting over our triple valves within 2½ years. Attention was called to it and we gave instructions that the triples should be cleaned, but after a little while we found that the work was not being done very satisfactorily; there was more or less trouble with it. We then took our air-brake instructor from his usual work and put him to instruct the men how to clean the brakes. The things he discovered were simply astounding, and I would not like to tell you all the conditions he found in connection with the triples. I advise you all to start out and have your air-brake instructor show the repair men and inspectors how to properly clean and repair the triples and cylinders, and when that has been done start in and keep a record and see that you go over all the air-brake cars once every twelve months.

Invitations for the next meeting were received from Niagara Falls, Old Point Comfort and Atlantic City. The committee, consisting of Messrs. R. C. Blackall, J. S. Lentz, W. J. Robertson, A. E. Mitchell and John Hodge, made the following nominations for officers for the ensuing year, and these were duly elected:

For President, C. A. Schroyer.

First Vice-President, John T. Chamberlain.

Second Vice-President, J. J. Hennessey.

Third Vice-President, W. J. Robertson.

Executive Committee—E. D. Bronner, J. H. McConnell, William Apps.

Treasurer, G. W. Demarest.

Master Mechanics' Reports.

The following reports were presented this week at the Saratoga meeting of the Master Mechanics' Association:

Best Method of Boiler and Cylinder Insulation.

Your committee, appointed to report on the "Best Method of Boiler and Cylinder Insulation," issued a circular of inquiry to which there have been 34 replies, representing 11,329 locomotives.

The circular and replies were as follows:

1. Do you use any kind of insulating covering for your boilers other than wood? To this 28 railroads representing 10,098 locomotives, replied in the affirmative; five, representing 582 locomotives, replied that they used wood only; one railroad, representing 649 locomotives, stated they used wood covering principally, but were trying a few other kinds to find the relative value.

2. If so, what has been your experience, compared with wood lagging, from an economical standpoint? To this five replied they had no experience, seven did not venture an opinion on account of limited experience, 22 replied it was more economical than wood.

3. If you have made any tests, please give committee the result, setting forth the manner of arriving at same. To this all replied they had made no special tests.

4. Give cost per square foot applied and kind of lagging referred to; the latter for information of your committee only. There were 20 replies to this; nine showing lagging costs from 21 to 29 cents per square foot applied, 11 stating that it costs from 7 to 18.6 cents per square foot, according to thickness.

5. If any experience with lagging the sides and heads of boilers, please give same. Two roads replied that they lagged both sides and heads of boilers; four that they lagged the sides only; three that they lagged the heads of certain engines, with large boiler heads, on account of excessive heat in the cabs.

6. If any experience in approved methods of lagging steam chests and cylinders, please give, in detail, the manner of doing it. To this 19 replied that they had no experience whatever in lagging cylinders and steam chests. Of the 15 that had some experience, six used wood, one filled all spaces around casings and coverings with hair felt, eight used different kinds of insulation. Note cuts showing the methods of lagging locomotive cylinders and steam chests; also of attaching removable lagging on sides of locomotive boilers, so staybolts can be readily inspected and repaired.

In order that all members may be conversant with the manner in which the committee arrived at their conclusions, the method adopted was as follows:

Samples were furnished by the manufacturers, with the exception of the wood, and in addition to these samples the committee took from store stock additional samples of each kind, which were tested along with those furnished by the manufacturers. The reason for this is obvious.

No. 1. This sample contained:

Asbestos	7.19	per cent.
Lime (calcium oxide)	31.64	"
Sulphur tri-oxide	48.70	"
Loss by ignition	9.60	"

No. 2 Pine wood.

Nos. 3, 4 and 5. These samples contained:

	3 and 5.	4.	
Asbestos	68.38;	64.84	per cent.
Oxide of magnesia	16.75;	22.70	"
Loss by ignition	14.90;	13.00	"

No. 6. The bare pipe.

No. 7. This contained:

Asbestos	43.97	per cent.
Lime	51.28	"
Rope	1.83	"
Sawdust	2.92	"

Nos. 8 and 9 contained as follows:

Asbestos	4.0	per cent.
Carbonate of magnesia	95.3	"

No. 10 contained as follows:

Asbestos	46.6	per cent.
Alumina and iron oxides	11.0	"
Magnesia oxide	25.5	"
Loss on ignition	14.3	"

Nos. 11 and 12.

No. 11 contains as follows:

Asbestos and silica	31.60	per cent.
Oxide iron	2.00	"
Oxide aluminum	15.30	"
Oxide calcium (lime)	35.10	"
Oxide magnesia	3.59	"
Sulphur tri-oxide	7.58	"

Samples Nos. 5, 8 and 11, being received in sheet form, were fitted to the pipe; the others were received in cylindrical form to fit a 4-in. pipe.

The samples, which were each 12 ins. in length, were placed on the pipe with a space of two ins. separating them; the ends and joints on each sample were sealed up to avoid the possibility of air circulation in the interior of the samples.

On each sample was placed a reservoir made of tin, 5⅜ ins. x 10 ins. in size, with concave bottoms to fit the sample, each having an exposed radiating surface of about 136½ sq. ins., and containing 3½ lbs. of water.

The thermometers used were carefully calibrated and compared.

A steam gage which had been compared with a standard test gage was placed on each end of the pipe.

The thermometers were inserted at the centers of the reservoirs to an equal depth into the water, after which the reservoirs were sealed tight.

The reservoir marked No. 6, which was placed on the bare pipe, exposed about 220.7 inches of radiating surface, and contained 7½ lbs. of water. For this reason, and the fact that the water in this reservoir boiled so soon after steam was turned into the pipe, the time temperature curve is incorrect; this could, however, be omitted without detracting in any way from the value of the tests.

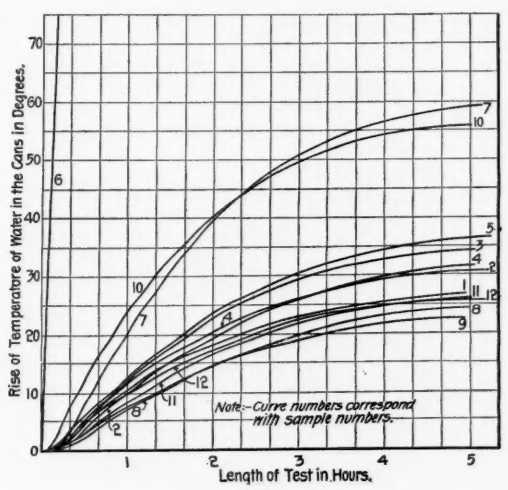

Rise of Temperature of Water in the Cans in Degrees.
Length of Test in Hours.
Note:-Curve numbers correspond with sample numbers.

Fig. 1.

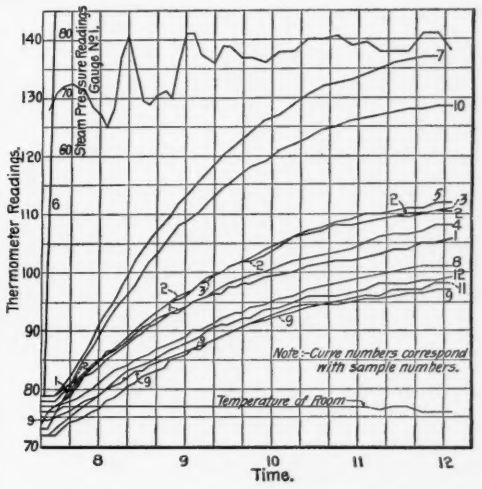


Fig. 2.

Result of Tests on Insulating Materials for Boilers and Cylinders.

A steam connection was made at one end of the pipe, and a drain provided at the other, the latter being kept slightly open during the test.

Observations began at 7:15 p. m. and were taken every five minutes up to 9:40 p. m., and from that time up to the close of the test every ten minutes, the result of which is clearly shown in the accompanying diagram, Figs. 1 and 2, the former showing clearly the rise in temperature of the water in the reservoirs; the latter the temperature readings every five and ten minutes, as stated.

Mr. T. Lyon, Master Mechanic of the Chicago Great Western Railway, in answer to the committee's inquiry, gives some interesting figures, based on the result of a test conducted by him some time ago, as follows:

"Prepared two lengths of 2-in. iron pipe, each 6 ft. long and connected with a boiler, by covering one of them with wooden lagging and a Russia iron jacket, and the other with mineral covering about 1 in. thick and a similar Russia iron jacket. These pipes were placed on an angle so that the water of condensation would drain toward one end, where there was a small cock, and both ends, as well as the steam pipes leading to them, were well covered by being wrapped with hair felt.

"Steam was turned on and the water of condensation drawn from each pipe and weighed at intervals of one hour, the amount of water being considered as a measure of the relative efficiency of the covering as non-conductors of heat.

"With an average steam pressure of 76 lbs. (absolute) in the steam pipe and an average temperature in the room of 56 degrees, the mean loss from the pipe lagged by wood was three pounds of steam per hour, and that from the pipe lagged with mineral, nine-tenths pound per hour, corresponding to a loss of heat of 448 B. T. U. and 139 B. T. U. per lineal foot per hour respectfully. This would indicate that the mineral lagging is almost three times as effective as the wooden lagging."

He goes on to state that the loss of heat would be about 0.34 B. T. U. per sq. ft. on radiating surface per degree of difference in temperature of the steam and the outside air, using mineral lagging, and 1.10 B. T. U. using wooden lagging, showing a difference in favor of the former of 0.76 B. T. U., and gives the following example:

"Taking a boiler with 300 sq. ft. of radiating surface, carrying 160 lbs. of steam and a mean outside temperature of 50 degrees Fahr., the difference in the loss would amount to 830 lbs. of water in 10 hours, representing, say, 166 lbs. of coal, or, at $1.50 a ton, 12½ cents' worth. In this should represent approximately the saving in coal by the use of a lagging such as tested instead of a wooden lagging under average conditions, and if these figures are correct, the mineral lagging would about pay for itself in a year. These experiments were made in still air; the conditions in service on a locomotive being still more favorable for further economy."

We found it impossible to collect any reliable data based on actual and practical results, as to fuel economy, as the variables entering into a test of this na-

ture are so great; hence it was not considered advisable to undertake it.

Your committee is decidedly of the opinion, notwithstanding the absence of this latter information, that economical results will follow the use of good non-conducting material, carefully applied to the boilers, cylinders, steam chests, steam passages, and all radiating surfaces where conditions are such that the estimated economy will not be overcome by the inconvenience and expense of removing same for repairs.

This report is signed by J. H. Manning, J. F. Deems and Wm. McIntosh.

Square Head Bolts and Nuts; Standards for Pipe Fittings.

The substance of this report is found in the following extracts:

On April 7 last a joint meeting of your committee and that of the American Society of Mechanical Engineers was held in New York, and a plan agreed upon which it is believed will accomplish the object for which your committee was appointed. This will require considerable time, as it includes designing a complete line of standard pipe unions, which can only be satisfactorily done after taking the matter up with the principal manufacturers of pipe fittings and giving careful consideration to this side of the question.

We are advised by the Chairman of the Master Car Builders' Committee, which is taking up specially the matter of standard square bolt heads and nuts, that final action on this subject will also have to be deferred until next year.

Your committee, therefore, finds it necessary to ask to be given more time in which to complete the work assigned to it.

This report is signed by Messrs. E. M. Herr, W. H. Marshall and C. H. Quereau.

Best Form of Fastening for Locomotive Cylinders.

The strains that the cylinder fastenings have to resist are:

First: The direct alternating thrust of the steam in the cylinders at the frames up to, say, 38 tons, reversing itself several hundred times a minute and increased to unknown amounts by shocks due to

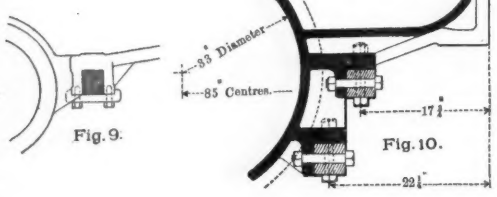


Fig. 9. Fig. 10.

Fastening for Locomotive Cylinders.

water in the cylinders. For instance, to knock out a 22-in. cylinder head would require something like 125 tons pressure suddenly applied, and the cylinder fastenings must not be phased by this.

Second: The direct forward and backward surging of the boiler—as the back end of the boiler must be on slides or links to allow for expansion and contraction, the cylinder saddles alone must resist the tendency of the boiler to move lengthwise, due to train and coupling shocks, collisions, etc. What the shearing strains on the saddle bolts and cracking strains on the saddles are when the momentum of one of our huge modern boilers is suddenly destroyed is not easy to conjecture.

Third: Forward and backward sliding of the two saddles on one another, due to the cranks being at right angles and the impulses in the cylinders not occurring simultaneously. This is greatest at the bottom at the level of the centers of the cylinders and least at the top of the saddle.

Fourth: Wrenching strains due to the engine curving, where one side of the engine must be held back by the other, and the adhesion of the wheels on the inner rail constantly broken. As there is no diagonal bracing to keep the frames from moving lengthwise separately from one another, this purpose must be accomplished by the strength of the cylinder saddle. Similarly, if the engine slips and happens to catch on one side first, very severe wrenching strains are produced in the saddles.

Fifth: The forward thrust on the cylinder and smoke-box bolts, due to the expansion of the boiler and resistance sometimes offered by the back boiler fastenings being defective or jammed.

Sixth: Wrenching of the saddle, due to the back end of the boiler swinging laterally on the frames; this is a very frequent defect with long boilers having heavy fire boxes, and is especially noticeable on engines having poor back boiler fastenings when they are slipping.

As to this last—sixth—cause is attributable most of the trouble with looseness between the smoke-boxes and saddles, we will refer to this matter first. If we wish to steady a pendulum, hammer or axe from moving, we fasten it by the weight or head; we do not leave the heavy end insecure and then attempt to prevent it moving by gripping the end of the handle extra tight. Similarly, the place to remedy the looseness of the cylinder saddle and smoke-box joint is at the back end of the boiler.

In reviewing the information gathered on this head, we see that, considering what has been said above, the best designs for securing the back ends of boilers to frames to prevent wiggling would be such that:

The weight of the boiler should be carried on two, or preferably four, long slides up to 12 ins. in length and over.

The weight of the boiler should be transmitted directly from the mud ring to the top of the frame through substantial chafing pieces on the frames, which can be easily renewed if worn; the mud ring being machined where it rests on these as at Figs. 1, 3 and 4.

The weight of the boiler should not be carried by pads on the sides, depending on studs or rivets, as at Fig. 2.

The boiler should be held down firmly to place by four side clamps, as at Fig. 1 or Fig. 3, which are not depended on to hold the boiler laterally.

In addition to the lateral security afforded by bearing pieces such as are shown in Figs. 3 and 4, the boiler should be held to place laterally by strong bracing placed crosswise under the boiler at the front of the fire-box, and, where practicable, across the back of the fire-box where the material can be disposed in the best direction to resist lateral movement, and tie both frames together, as indicated in Figs. 5, 6 and 7.

The boiler should also have at least one expansion brace, as at Fig. 8, to help keep the boiler and frames from the slightest relative movement or springing; but to be of lasting service this expansion brace must be made with double heavy angles at the boiler, close riveted to the shell (2½ to 3 ins. spacing, ¾-in. rivets), and similarly close riveted in reamed holes between the angles and the expansion plate, and firmly secured to the cross-brace, which must be well lipped over and bolted to both frames, Fig. 8. By using a broad steel casting for the cross-brace greater stiffness is obtained and it helps to brace the frames. To use a single T or angle iron at the boiler with a few bolts to hold the plate to this is a dead waste of material.

Carrying the back end of the boiler on links and pins is bound to lead to trouble sooner or later. The bearing surfaces cannot be large; they will be hot all the time, and as they cannot be successfully lubricated, must be made a loose fit to start with or they seize and wring off. When thus made a loose fit they permit the initial looseness which, with the constant jarring and pounding of the weight of the boiler on these two or four pins, soon produces considerable slack which will break off the pins eventually and in the meantime allow the back end of the boiler to waggle on the frames, thus wrenching the cylinder and smoke-box fastenings severely. The smoke-boxes of our heavy engines have been too often made as if they had no other duty to perform than to hold smoke, and because they have no steam pressure to retain are made of flimsy sheet steel, whereas the smoke-box is really a part of the foundation of the whole machine.

How can we expect to hold the heavy boiler firmly to the cylinder saddles and frames without any buckling and giving when the smoke-box is only made of ⅜ or ⅝ metal? The smoke-box should be made of as heavy plate as the boiler itself, and there should be a strong attachment to the boiler by means of a wide 1-in. thick ring, as well as a second ring at the front of the saddle and bars 8 to 10 ins. wide, all closely riveted to the smoke-box. This gives all the bolts through the saddle and smoke-box the same length and a good 1¾ ins. of metal for reaming to a good fit.

One member very pithily writes: "We find that too many bolts cannot be used in securing the saddles to the smoke-boxes;" but it is believed that if the back ends of the boilers are well secured as recommended previously, fastening the saddles to the smoke-boxes with a double row of 1¼ in. or 1⅜ in. bolts all around, spaced 4½ ins. or not over 5 in. pitch, having the flanges of the saddles strengthened by ribs all about as shown on Fig. 9, will form, with honest workmanship, as secure a fastening as is needed, but not more than is really essential for heavy locomotives. All the bolts holding the saddle to the smoke-box should be on the outside of the saddle in the flange, with heads inside and nuts underneath, where they can be seen. Bolts inside the saddle, put up from underneath, which cannot be made a driving fit, and the nuts for which must be inside the smoke box, are believed to be not worth the trouble of putting in. They cannot be properly fitted or inspected afterward for looseness; the nuts are subject to the heat, and, being located near the center of the saddle, they have not the same leverage to hold the saddle steady as they would have if placed on the outside.

Incidentally, it may be interesting to call attention to the necessity of using bolts of large size and hard, tough metal, experience having shown that after careful reaming and fitting the fit can be ruined and the bolt left loose in the hole after drawing up with a long wrench, by the stretch of the bolt if made of too small diameter or of too soft material.

Considering next the fastening of the two cylinders together, it must be remembered that the force tending to separate or slide on one another is exerted at the bottom on the plane of the centers of the two cylinders, and not at the top. To resist this to the best advantage the strength of the fastening should be at the bottom and not at the top, and yet we find arrangements where the bolts are very poorly disposed; but the same amount of metal in short bolts at the bottom of the saddles would have been much more effective.

The continual trouble from loose and cracked cylinders has led to the very common use of cross-frame braces lipped over the frame bars and shrunk on, both front and back of cylinders on both upper and lower frame bars. When such braces or clamps are used it is necessary that the frames should have a good inside bearing against the cylinder saddles, so the clamps will pull the frame against the casting, and not pull against or shear the frame bolts.

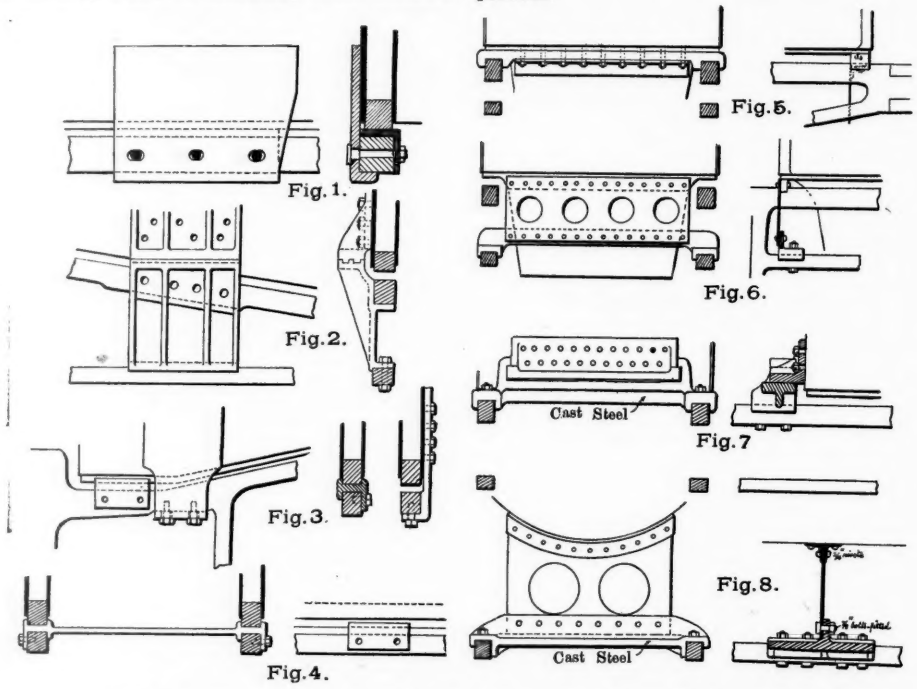
But it is believed that if the saddles are correctly designed in other respects and the frames properly proportioned and connected such clamps will not be found necessary; but the saddles should be bolted together as in the diagram, and it is a good plan to fit one, or perhaps two, good keys in this bottom horizontal joint to relieve the bolts from shearing strains. These keys can be chipped off flush at the bottom and prevented from working down by placing them over the truck center or equalizer fulcrum casting.

Before discussing the fastening of the cylinders to the frames there are some questions strongly bearing on this which may be profitably considered. Referring to the strains on the cylinders and saddles previously described in the six numbered paragraphs, it will be seen that there are some that must be wholly absorbed by the strength of the saddle. The plain, bottomless box form of saddle with cored steam and exhaust passage looks massive enough, but the metal is disposed in the weakest possible form to resist the strains referred to. Above all, there is need of plenty of metal to act as a horizontal bed plate at or near the plane of the center lines of the cylinders. We find efforts to remedy this lack by numerous clamps shrunk on in front and back of the cylinders to strain them tighter together, but here again the metal is applied at right angles to the direction of the strains. We also find horizontal plates applied front and back of the cylinders lipped for the frames, in some instances these being bolted to flanges cast on the saddles for the purpose, and again others have been driven to the use of long cast-iron bumper deck plates, filling the entire space from the saddle to the front bumpers. All these are remedies for an originally bad design. There seems to be some tradition, that no one has yet broken away from, that the saddles must not be any longer than the cylinders. For instance, for a 14 in. x 24 in. cylinder the saddle would be about 28 in. long; for a 33 in. x 24 in. cylinder the saddle would still be 28 in. long. The length of the saddle is its strength, to a large extent.

Is there any reason why the saddle should not be made 6 ft. long between the frames and thus furnish horizontal longitudinal stiffness which would keep the cylinders and frames square? This would do away with the necessity for clamps, plates and extra castings. But there are still formidable strains on the saddles that require additional strength in the upper part, and it is certainly good practice to rib the saddle vertically on both sides, front and back, and also use horizontal ribs.

To revert incidentally to a detail that is of real importance, attention is called to the necessity of making all keys and keyways, as well as all slots and angles where frame bars are bolted to cylinders, with fillets in the corners. Sharp corners are always weak spots, and prove themselves too often starting points for cracks.

Reverting to the argument previously made in favor of rigidity and against elasticity in the construction of the frames and attachment to the cylinders, it will be admitted that the recommendations of several prominent members to the effect that double-bar frames should be always used for heavy locomotives, even of the eight and ten-wheeled types, is in the right direction, and we recommend this as good practice.



Fastenings for Locomotive Cylinders as Described in Report of Master Mechanics' Committee.

Where single-bar frames for special reasons must be used they should be made of proportionately greater strength. It seems absurd to continue using 4 by 4½ single-bar frames for all sizes and powers of locomotives. In passing, we wish to call attention to a method of securing frames to cylinders which is illustrated at Fig. 9. This plan has been used with reported success for many years on several well-known railroads. It is a departure from the usual practice, in that there are no bolts securing the cylinders to the frames, which are set into troughs in the saddles, held there by caps, and are secured lengthways by stout keys front and back of the cylinders. Fig. 10 shows a satisfactory method of securing the frames to the cylinders where the cylinder diameter was large and it was necessary to keep the cylinder centers as close together as possible.

There are some points in connection with fastening the frame bars to the cylinders that are common to all, that should be mentioned. Long, vertical bolts through top and bottom frames and cylinders should be avoided. They are expensive to turn, the reamers are expensive and most difficult to make, the castings are troublesome to core and the stretch under equal tightening is not the same as for the short bolts.

Tap bolts might just as well be left out, to start with, for all the good they ever do.

Keys between the cylinders and frames should be made large enough and very carefully fitted to a perfect bearing before final driving.

Both top and bottom bars should butt solid up against the back of the cylinders, being machined to a gauge, and the cylinders faced off accurately; this insures perfect squareness, keys being used in front to draw the frames up solid to the cylinders before the bolt holes are reamed. Continued trouble with loose splice joints in the frames has led to the use of blocking castings between the top and bottom bars of the frames behind the cylinders, and there is no doubt this is very good practice. This same trouble has led some to do away with one splice joint and carry the main frame forward to the front edge of the cylinder; but if this is done the top frame, which is the main strength of the frame, should be carried forward over the cylinder, giving a solid forging from the front of the saddle to the back tail bar.

Finally, it may be predicted that a few years will see the very general use of cast steel for locomotive frames, and as the possibilities with this metal are great, it may be that we will find both frames and cylinder saddles all cast in one piece with the two cylinders, and the upper part of the saddle made of cast-iron and bolted on.

This report is signed by R. P. C. Sanderson and T. L. Chapman.

Supplemental Report on Fastening for Cylinders, By Mr. J. E. Sague.

The chairman of the committee was unable to assist in the final preparation of the report and the work was therefore kindly assumed by Mr. Sanderson. The following is submitted by the writer as an additional discussion:

The strains on cylinder fastenings, as well as upon other parts of locomotives, have been much increased within the last few years by the notable rise in boiler pressures, which has resulted in a more marked increase in locomotive power than is indicated by comparison of cylinder sizes only. Thus many recent designs of locomotives have 20x26 cylinders with 200 lbs. boiler pressure, or the equivalent of a 23x26 cylinder with 150 lbs. of steam. Modern systems of tonnage rating have also added to strains imposed upon locomotives, making it certain that they will exert their full power more constantly than ever before.

A decided limit, however, is imposed upon the weight of material to be used in cylinders and frames by the demand for high boiler power, and it is very common for builders to have specifications submitted to them calling for greater boiler capacity than can be obtained within the permitted limits of weight, after all possible has been done to lighten other parts. It will be admitted that in order to obtain the best road locomotives, either passenger or freight, the boiler must be made as large as possible, and with this in view the weight of all other parts must be kept as low as design will permit, assuming reasonably good handling and attention to running repairs, and this condition should be kept carefully in mind in considering the design of cylinders, frames and cylinder fastenings.

The principal strains to which cylinder fastenings are subjected are thoroughly discussed in the committee's report. The effects of these strains on cylinder fastenings, however, are believed to be greatly modified by the use or absence of a foot plate. A foot plate well bolted and keyed holds the frames rigidly in line with each other lengthwise and thus reduces greatly the racking strains upon the cylinders due to the action of the steam. Consolidation and other types of locomotives which have no foot plate, therefore, require exceptional strength in the cylinder fastenings, unless the equivalent of a foot plate is provided. . . .

In recommending designs of cylinder fastenings distinction should be made between passenger and freight locomotives, even where the cylinder power is the same. Passenger locomotives exert their full tractive power only at starting and the cylinder fastenings are not exposed to as severe continuous strains as those of freight engines. Passenger locomotives, as a rule, also receive better care. Large boiler power is of such supreme importance in passenger locomotives that the weight of all other parts must be reduced as much as possible. These considerations, it is believed, justify the use of lighter cylinder fastenings than would be good practice for freight. This is especially true for eight-wheel passenger locomotives, whose truck and driving wheel weights are apt to be close to the track limit.

Referring to the connection of cylinders to boiler, the replies indicate but little trouble with this fastening. Several recommend double bolting either front or back or on the side flanges. Double bolting front and back or on the side is extensively used on heavy locomotives and in a few cases cylinders are double bolted all around. Double bolting front and back has the advantage of lengthening the cylinder fit on the smoke arch, and enables the maximum number of bolts to be placed through the smoke box rings, but for equal weight of metal in the flanges the double side bolting enables more bolts to be used.

Regarding the connection of cylinders to frames and the design of the frames at the cylinders, practice varies greatly and it is difficult to lay down any rules which will be of general value; especially is this true regarding the choice between single and double bar front frames. Double front frames give a more secure cylinder fastening than can be obtained with single rail frames. They make an especially good design for consolidation, mogul and other locomotives in which the drivers are close to the cylinders, and are being widely adopted for heavy ten and twelve-wheel locomotives. Considering the strength of the frames only, the design of double front frames involves the use of more weight for equal strength than with single, and this is an important reason for the continued use of single front frames on so many recent eight-wheel passenger locomotives. For this type of locomotive the great length of single front rail permits some flexibility, and there is less liability of the strains being concentrated at breaking point than if the rails were short. With the single front rail bolted on a line with the centers of the cylinders the strains due to the steam pressure are taken directly. With double front frames these strains are exerted mostly upon the bottom rail, as this rail is necessarily much nearer to the center of the cylinder than the upper one. The bottom rail therefore requires nearly as much section as if a single rail only were used. The breakages of upper rails, however, show that important strains are transmitted through them, and these are probably quite complex. Very great strains are brought on the upper rail by the expansion of the boiler, especially when the expansion pads are binding. Any yielding or springing of the bottom rail will also throw disproportionate strains on the upper one. The experience of members indicates that to avoid trouble with double front rails it is necessary to design them so as to be as free from bending strains as possible and to connect them so that they will resist the strains almost as if made of one piece; otherwise the rails may yield and break in sections. The indications point to bending strains localized where the working and breakage are noticed and it is also believed that this working was largely caused by the sticking of the expansion pads on the sides and back of firebox. To resist these strains more successfully filling blocks are put in and are found to meet the difficulties successfully. For ten and twelve-wheel locomotives which involve greater length between the forward pedestal and the cylinders the filling pieces are thought to be even more necessary than in mogul and consolidation locomotives, and it is believed that double front frames not provided with such bracing will give more trouble than single bar frames. Mr. Middleton of the Baltimore & Ohio advises single front frames on eight-wheel locomotives and on ten wheelers having a considerable distance between the front pedestal and the cylinders. Mr. Vauclain writes: "We recommend single front rails for frames on engines having a four-wheel truck ahead, and double frames for two-wheel trucks. In any case where the single front frame is radically out of line with the draw head double frames should be used."

The writer believes that the following is good practice: Double rail front frames should be used on all consolidation and mogul locomotives and on heavy ten and twelve-wheel freight locomotives, especially where built for mountain service. Single front frames should be used on eight-wheel passenger locomotives, as they have been found amply strong for this class of engine with good design and maintenance, and because the use of double frames would necessitate increased driver and truck weights for a given boiler capacity. The same applies to fast passenger ten wheelers where great boiler power is desired and where close limits of weight are to be conformed to. For large ten-wheel passenger locomotives to be used on mountain work or in exceptionally severe service, the better cylinder fastening obtained by the double front frame makes its use advisable. Filling blocks should be used for double rail frames, as before indicated, and the splices between the front and main frames should, as far as possible, be designed to avoid bending strains. . . .

To prevent cylinder saddles breaking, due to the expansion of boiler, some members recommend outside vertical ribs. These, with the lower cross ribs shown and with the bolts through the outside lugs which the ribs form at the frame connections, are believed to make a very secure job.

Regarding the advisability of using cross ties front and back of cylinders or long transverse bolts through the cylinder saddles, there has been a strong expression of opinion from members in favor of using one or the other of these devices. For double front rails, cross ties lipped over the top rail and shrunk on front and back of the cylinders assist in tying the frames to the cylinders and also greatly help the connections between the cylinder saddles. The action of the steam in the cylinders tends to spring the frames otherwise and separate the cylinders where bolted together, thus practically bringing a cross-bending strain upon the saddles, and the cross ties are very effective in resisting these strains. Cast iron, although very strong in compression, is deficient in tensile and transverse strength, and it is therefore believed that wrought iron cross ties serve a better purpose in reinforcing the cylinder saddles than would be obtained by increasing the saddle length, and with much less increase of weight. Where cross ties are used suitable flanges, of course, should be provided on the cylinders to resist the pull of the cross ties. Inside lips on the cross ties are unnecessary, and if well fitted prevent the cross ties being shrunk on after the frames are bolted in place. The advantage of cross ties is shown from the fact that they are used successfully to hold cylinder saddles after cracking, and therefore cannot fail to assist in preventing cracking. Long transverse bolts through the cylinder saddles serve the same purpose in holding the saddle together as cross ties, and have been found very useful on many roads, but they are not thought to be as effective as cross ties, as they do not assist in holding the frames to cylinders and cannot be spaced as advantageously to resist bending strains in the saddles. They are useful, however, for cylinders having single front frame connections. Where used they should be placed as low down in the saddle and as near the back and front as possible. . . .

Tonnage Rating for Locomotives.

This report is signed by G. R. Henderson, F. Hufsmith and T. B. Purves, Jr., and opinions in the text are frequently given as the conclusions of "your committee," but the opening paragraph says that the Chairman was not able to secure any help or co-operation from the other members of the committee.

Circulars were sent out and replies were received from 43 roads, operating 66,000 miles. Some of these have been rating engines by tonnage, they say, for fifteen years, but most of them for not more than two years. All agree as to the general advantages; heavier average trains hauled with less stalling; more uniform loads and better condition of engines, particularly the tubes, on account of not being overloaded; less friction between motive power and transportation departments, and more satisfactory results in every way.

Some roads estimate the increase in service as high as 43%, but the average is probably between 10 and 20. Twenty-two roads rated their engines by experiment; 14 first made estimates by theoretical computations. The most elaborate tests for rating were by the Southern Pacific, and these are set forth at length in the report. The substance of the Southern Pacific plan was given in the Railroad Gazette of May 21, 1897, p. 355.

Mr. Tweedy, Chief Engineer of the Wisconsin Central has made elaborate theoretical calculations and thinks that with sufficient labor and care all necessary rating could be made in the office and experiments with trains would not be necessary.

The committee gives elaborate formulas for calculating the tractive force of locomotives, using considerable material from the report of the Committee on Heating Surface last year. This part of the report appears to have been very carefully made, and facts or opinions taken from other writers are accompanied with references to the authority. The adhesion of the locomotive is calculated in accordance with a Master Mechanics' Committee report of 1897, later experiments, however, being taken from the last Baldwin catalogue.

The resistance of trains due to speed, grade, curvature and acceleration is discussed at length, the conclusions of last year's report on Cylinder Volume and Grate Area being adopted. A chart from last year's report is given and there is appended a diagram by Mr. Tweedy, showing the actual profile of a section of his road with the virtual profile for engine rating based on the advantage derived by momentum. By running at 30 miles an hour on descending grades the next ascending grade can, of course, be surmounted with a much heavier load than could be started from a dead pull. Diagrams are given to facilitate computation of resistances as affected by running for grades.

On the Southern Pacific, the Great Northern, the Norfolk & Western and other roads the actual power of locomotives on grades was found to be always very nearly the same as the calculated power, the actual being generally a little higher. On the Shenandoah Division of the Norfolk & Western, however, on a 79 ft. grade, one class hauled only 530 tons as compared with a calculated power of 552 tons.

Allowance for additional friction in empty cars is treated very briefly. Some roads allow 8%, some 10; and two allow 25%. Others use the old plan of rating three empty cars as two loaded; or two to one, five to two, five to three, etc. Reference is made to charts used on the Chicago Great Western and the Northern Pacific, which were given in Mr. L. R. Pomeroy's paper before the New York Railroad Club, last January. The Northern Pacific chart was shown in the Railroad Gazette of June 25, 1897, p. 461. This part of the report says nothing about the additional friction in a train of empty cars due to the additional length of the train and the consequent liability that more curves or switches may be encountered simultaneously. The Canadian Pacific and the Great Northern allow 7% deduction for frosty or wet rails, 15% when the temperature is between 32 degrees F. and 0; 20% when between 0 and 20 degrees below. The Columbus, Hocking Valley & Toledo makes six variations for temperature, a different percentage being prescribed for each 10 degrees, from 40 degrees above to 20 degrees below zero. This road also allows 12% for engines that have been out of the shop a year, and other percentages for shorter or longer times.

Rules for ascertaining the weight of cars are given at length as taken from the circulars of the Chicago & West Michigan, the Erie, the Southern Pacific, the Chicago Great Western and other roads. The committee recommends marking the class of an engine on the apron of the cylinder.

An appendix to the report gives tables of ratings of engines used on the roads above mentioned and also on the Atchison, Topeka & Santa Fe.

Efficiency of High Steam Pressure for Locomotives.

At the time this committee was appointed it was expected that the experimental locomotive at Purdue University would serve to give sufficient data to permit the presentation of a report dealing entirely with experimental facts. Unexpected delays have been met and the problem has proven to be an extensive one. While more than thirty tests have been run, the full significance of the data obtained cannot be known until it is supplemented by information yet to be supplied. For this reason it has been thought best to withhold the experimental data thus far obtained until the investigations shall have developed definite conclusions. Some reference may, however, be made to the tendencies disclosed by the work already accomplished, and a general discussion of the question may be introduced.

The locomotive with which the two Stephensons competed for and won the prizes at Rainhill carried a steam pressure of 50 lbs. per square inch.* This was 70 years ago. Since the time of the Rocket the pressure on locomotive boilers has been gradually increasing, and to-day practice in America involves the use of pressures which fall between the limits of 140 lbs. and 200 lbs. While many locomotives are running under pressures which are near the lower limit, few are now being built which are designed to

*Smiles' "George and Robert Stephenson," page 217.

carry less than 180 lbs., and a pressure of 200 lbs. has ceased to be uncommon. What lessons are to be derived from the experiences of the past, and to what extent are they to be relied upon to guide the practice of the future? Will the tendencies which have manifested themselves in the past continue to prevail? Are we to look for a gradual increase beyond 200 lbs., or has the maximum limit already been reached? These are the important questions which naturally suggest themselves in connection with the subject which is to be presented by this report.

Power and Efficiency.—The power developed by a locomotive is a measure of the work done by the steam in the cylinders; it is a function of pressure, steam distribution, diameter and travel of piston, and of speed. The efficiency of a locomotive is a measure of the degree of perfection attending the development of power; concisely stated, it is the ratio of the heat equivalent of the work done in the cylinders to the heat supplied the firebox. That engine is most efficient which for each pound of coal burned develops the largest amount of power in the cylinders.

Anything which affects the efficiency either of the boiler or of the engines of a locomotive affects the efficiency of the locomotive as a whole. Boiler efficiency depends upon the proportions of the boiler and the rate of power to which it is worked, while engine efficiency depends upon many factors of which initial pressure is but one. Whatever gain in efficiency is to be derived from the use of higher steam pressure in locomotives is, therefore, to be found in the improved performance of the engine. An ideal engine will always give increased efficiency in return for increase of pressure, but the actual engine may or may not do so. (Appendix I.)

While the term "efficiency" should not be confused with "power," these terms express facts which, in a locomotive, are closely related. Under normal conditions, a locomotive is worked so near its maximum power that the limit of power is determined by the amount of coal it can burn. If improvement can be had in the process of combustion, or in the more complete absorption of heat by the heating surfaces, or by a reduction in the amount of fuel lost as sparks, the efficiency of the boiler will be increased, and at the limit of power this improvement in performance can be converted into an increase of power. Again, if the cylinders can be made to better utilize the heat supplied them, they may with a given amount of steam be made to yield greater power. It is safe, therefore, in summarizing these statements to say that anything which will operate to improve the efficiency of a locomotive may be employed as a means for increasing its power. If, therefore, increased pressure increases efficiency, it is clear that every interest will be served by its adoption.

Pressure a Single Factor Affecting Efficiency.—There can be no question but that the gradual increase of pressure which has been developing itself for many years past, has been accompanied by increased engine efficiency. It is, however, probably true that much of the improvement which has been observed is the result of betterments in mechanism, as well as of advance in the direction of pressure. This fact makes it desirable to emphasize at this point a matter to which brief reference has already been made, namely, that pressure constitutes but a single factor affecting the performance of an engine. Equally important with pressure are questions of valve proportions and of valve setting, of cylinder clearance and degree of expansion. Moreover, the significance of all these factors is increased as the pressure is increased. Great improvement in efficiency, therefore, should not be expected as the result of attention given to the matter of pressure alone. On the contrary, it should be assumed that each increase of pressure is a demand for greater refinement in the mechanism of the engine. The valve action must be positive and must give a good distribution of steam at short cut-offs; the cylinder clearance must be minimum, the extent of surface bounding the clearance volume must be held to its lowest limits, and as pressures increase, compound cylinders must be used. With such attention to details, it is probable that each increase of pressure will be found to contribute its share to the progress of the future. (Appendix IV.)

There are those who view the situation to-day with the feeling that increase of pressure, being rather easily obtained, has advanced more rapidly than other measures affecting the efficiency of the locomotive. They assert that time must be had in which to perfect other details before further advances in pressure are made. If this position is true, it is likely that as in marine practice an advance in boiler pressures awaits a general adoption of the water-tube boiler, so in locomotive practice a further advance in pressure awaits the more general advent of the compound engine.

It is frequently assumed that the process of gradually increasing pressure beyond limits now common will soon reach a point beyond which it will be found impracticable to go. Difficulties in maintaining a satisfactory condition of lubrication, in using soft metal packing, and in using water glasses under pressures which much exceed 200 lbs. are often cited in this connection. It would appear, however, from experience already had in marine work, that none of the difficulties are such as will block the way to the adoption of higher pressures whenever it shall be demonstrated that higher pressures are needed to further increase the efficiency of our locomotives.

High Pressure on Simple Locomotives.—The term "high pressure," as employed in this paragraph, refers to pressures above 160 lbs. The effect of such pressures on the performance of non-compound locomotives is now to be considered. The arguments for and against their adoption may be summarized as follows:

In Favor of Higher Pressures.	Against Higher Pressures.
1. Smaller cylinders, and consequently lighter reciprocating parts.	1. Increased weight of boiler.
2. Reduced width of engine outside of cylinders.	2. Increased first cost of boiler.
3. Reduced first cost of engine.	3. Increased transportation charge, due to increased weight of boiler.
4. Reduced transportation charge because of reduced weight.	4. Probable increase in small heat losses, as from radiation and from leakage past valves and glands.
5. A possible gain in the efficiency of the engine, whereby a given power is developed on less steam and on less fuel than could have been done with a lower pressure.	

It is assumed that, other things being equal, the evaporative efficiency of the boiler will not be changed by such modifications as are necessary to enable it to withstand increase of pressure; the evaporative efficiency does not, therefore, appear as a factor on either side of the argument.

It is assumed also that cost of lubrication and of repairs to boiler and engine do not necessarily change with changes in steam pressure. (Appendix III.)

Reviewing the arguments as summarized above, it is to be noted that the important factor favoring the adoption of higher pressure is the possible economy which is expected to result. The other advantages are incidental, and while some of them may have great weight in particular cases, their significance in the general case merits but slight attention.

The economy which is to result from an increase of pressure must be sufficient to balance all of the considerations which in the foregoing summary appear against the adoption of such pressures. It is evident that unless the gain in efficiency is material, the net result of increasing pressure will be disappointing.

In this connection it will be profitable to review briefly the results of tests run under different pressures on the experimental locomotive of Purdue University. This locomotive carries 250 lbs. pressure; its cylinders, having been constructed for special investigation, have an unusually large clearance, and at the time of the tests the valve setting gave excessive lead at very short cut-off. It is significant that these defects were sufficient in their effect to more than neutralize the gain which might otherwise have resulted from the use of higher pressures. It is, in fact, so easy to fail in securing the anticipated gain from increase of pressure, through some minor defect of design or of adjustment, as to make it probable that the most economical pressure for simple engines, in their present stage of development, is within the limits of present practice. (Appendix IV.)

High Steam Pressures for Compound Locomotives.—It has already been argued that compounding is a means to the economical employment of high steam pressures, from which it follows that the maximum pressure for compounds is higher than for simple. Existing data is insufficient to serve as a basis for any prediction as to the effect of successive increments of pressure upon the efficiency of compounds of existing types.

High Pressure and Engine Dimensions.—As is well known, the volume of the cylinders of an engine which is to develop a given power is, other things being equal, inversely proportional to the available pressure. As the steam pressure is increased the size of the cylinders may be reduced. On many roads, the width of engines over cylinders is already very close to the clearance width along the right of way. On such roads a demand for engines of greater power cannot be met by increasing the diameter of cylinders; hence, resort must be had either to a longer stroke of piston or to higher steam pressure. Demands of this nature will unquestionably stimulate a tendency to the employment of higher pressures and the end will justify the means.

Boiler Pressure vs. Boiler Capacity.—It is not the purpose of this report to enter upon a general discussion of conditions affecting locomotive efficiency, but the question of boiler pressure is so closely associated with that of boiler capacity that a brief reference to the latter subject seems desirable.

The preceding discussion discloses the fact that the proposition to improve the economy of a simple locomotive by increasing pressure beyond present limits is of doubtful value. When viewed as one of several expedients which are open for adoption, it is manifestly not of first importance. For example, within limits now common, an increase in boiler capacity offers a way to increased efficiency which is both sure and significant. If, for example, it is desirable to increase the efficiency of a locomotive now carrying 140 pounds of steam, by giving it a new boiler of the same dimension with the old, but designed for a pressure of 200 pounds, the effect produced will be entirely due to increase of pressure. The economy resulting cannot be large, and may, as in the case of experiments already cited, amount to nothing. The new boiler may weigh, approximately, 5,000 pounds more than the old. Now, it can be shown that if, instead of adding to the weight of the locomotive by making a stronger boiler, the same increase of weight had been applied to making a larger boiler, the resulting economy would not fail to be material. (Appendix V.) This report is signed by William F. M. Goss, William Forsyth and Tracy Lyon.

Appendix.

A brief review of some of the more important facts relating to the use of steam at different pressures is herewith presented (Table I.):

Table I.—Facts about Steam at Different Pressures.

Gage pressure. Pounds.	Temperature of.	Increase in temperature for each 25 lbs. increase in pressure.	Total heat in one pound of steam above the heat of freezing water.—B. T. U.	Increase in thermal units in one pound of steam for each 25 lbs. increase in pressure.	Pounds of steam per I. H. P. per hour required by a perfect engine. Back pressure, 1.3 lbs.
I.	II.	III.	IV.	V.	VI.
25	266.6	....	1.163	....	39.40
50	297.5	30.9	1,173	9.3	26.25
75	319.8	22 3	1,179	6.9	21.57
100	337.6	17.8	1,185	5.4	19.53
125	352 7	15.1	1,189	4.5	17.54
150	365.7	13.0	1,193	4.1	16.45
175	377.3	11.6	1,197	3.5	15.62
200	387.8	10.5	1,200	3.1	15.00
225	397.3	9.5	1,203	3.0	14.51
250	406.1	8 8	1,206	2.6	14.17
275	414.2	8.1	1,208	2.5	13.74
300	421.8	7.6	1,210	2.3	13.39

The relation of temperature and pressures is shown by Columns I. and II., and the rate of increase of temperature for equal increments of pressure, by Column III. It will be seen that when the pressure is low, a small change in pressure produces a marked change in the temperature, but when the pressure is higher, changes in pressure have less effect upon the temperature. For example, changing the pressure from 25 to 50 lbs. produces an increase of temperature of 31 deg., while changing the pressure from 275 to 300 lbs. produces an increase of temperature of only 7.6 deg. It is interesting to note, also, that a pressure of steam as high as 300 lbs. involves temperatures which are only a little higher (34 deg.) than those which are already dealt with in locomotive service as a result of pressures of 200 lbs.

Total Heat.—The amount of heat which must be expended to change a pound of ice cold water into steam at the several pressures named is shown by Column IV. The values in this column are in British thermal units. The amount of heat needed to produce 25-lb. increments of pressure is shown by Column V. It will be seen that practically it costs no more to make steam at 150 lbs. pressure than to make it at 100 lbs.

Steam Consumption of a Perfect Engine.—From theoretical considerations, it is possible to define the performance of a perfect engine working between any stated limits of pressure. No actual engine can ever give a higher performance than that of the perfect engine, but there is no theoretical reason why the performance of the actual engine should not approach and even equal that of the perfect engine. This fact makes the performance of the perfect engine a convenient basis upon which to measure the performance of actual engines. Again, it is often assumed that the effect of a change in steam pressure on the performance of any actual engine will be proportional to the similar effect produced in the performance of the perfect engine by the same change in pressure; so that, if the performance of an actual engine under one pressure is known, its probable performance under any other pressure may be predicted. Such a process is subject to limitations, and is one which can never be depended on to give results with absolute accuracy, but the relation between the actual and perfect engines is sufficiently close to warrant attention in this connection.

Column VI. shows the weight of steam required by a perfect engine when the pressure of exhaust is 1.3 pounds above the pressure of the atmosphere, and the initial pressure, that shown in Column I. This relation, also, is shown graphically by Fig. 1. Values in Column VI. may be compared with similar values derived from actual engines, but since each pound of steam contains an amount of heat varying with its pressure, they do not fairly represent the relative efficiency of the ideal engine under different pressures.

Two important facts are to be noted in this connection. One is that every increase of pressure results in a definite reduction in the amount of heat consumed per unit of power. It is this fact which is fundamental in any argument favoring increase of pressure. The second is that the rate of change diminishes as the scale of pressure is advanced. Thus, increasing the pressure from 25 lbs. to 50 lbs. reduces the heat consumption of the ideal engine 27 per cent., while an equal increment of pressure from 275 lbs. to 300 lbs. affects the performance of the ideal engine 2.9 per cent. It is evident from the statement of facts concerning the performance of the perfect engine, that chances for improving engine economy through increase of pressure have been greater in the past than they are likely to be in the future. Assuming the present limit to be 200 lbs., the possibility of improving efficiency through increase of pressures alone are not so great as when the limit was 100 lbs.

Increase of Pressure and Cost of Locomotive Repairs.

One of the prime difficulties in arriving at any very definite conclusions upon this subject lies in the fact that the greater number of the locomotive boilers now carrying the higher steam pressures have been in service but a comparatively short time. It is the opinion of some of the best authorities that no conclusive evidence bearing upon the maintenance of locomotives carrying high boiler pressures can be now presented. It should be noted in this connection that by "high pressure" is meant pressure approaching 200 lbs., and by "low pressure" pressures between 140 and 160 lbs.

While much trouble has been had from some of the earlier boilers carrying 200 lbs. steam pressure, in that their construction was to a certain extent experimental, there seems to be no reason why boilers cannot be built to successfully carry such a pressure. A materially increased weight must be looked for, a thickening of the plates and a more substantial staying and riveting; but this being done, it would seem to be established by close observation that the repairs of a boiler, properly designed for the service, are directly as the horse power of work performed, irrespective of the pressure carried. It has been suggested that the increased temperature of the fire-box sheets, due to an increased temperature of the steam, might injuriously affect the material, and that therefore it is desirable that the steel used in high-pressure boilers should be chosen and treated with special reference to its behavior under such conditions.

Passing to the question of the repairs to the machinery of the locomotive, it is difficult to find any evidence tending to show that other than the main valves, valve seats and valve gear, cylinders and piston rod and valve stem packing, are affected by high steam pressures. There seems to be no question but that higher steam pressures mean increased wear of the valves and seats, and possibly of the link motion, due to the drag of valves even as well-balanced as the ordinary slide valve may be. This is of course directly due to the pressure, in combination perhaps with the difficulty of obtaining sufficient lubrication with the present oiling devices, especially at high speed and short stroke. Those who have used piston valves appear to consider that they meet the requirements of high pressures much more nearly than any other form. The cylinders and piston packing rings are also probably affected by the severer service (see Proceedings, A. R. M. M. Association, 1897, page 197) as well as the boiler mountings. Rod packing of soft metal may be melted by the higher temperature of the steam with which it comes in contact and harder mixtures required.

One railroad reports the performance of ten engines carrying 200 lbs. pressure, in service from eight months to one year, as compared with the same number of engines carrying 150 lbs. pressure, in service for from ten to fifteen months, the figures given being for four months only.

Cost of running repairs per engine-mile:

High pressure engines, $1\frac{32}{100}$ cents. Average monthly mileage, 5,139.

Low-pressure engines, $1\frac{15}{100}$ cents. Average monthly mileage, 3,529.

An increase in the running repairs of the high-pressure engines as compared with the low pressure of 12 per cent. Even here, however, the engines carrying the high pressure are much the heavier, and upon a ton-mile basis, instead of a train-mile, the balance is the other way.

It is evident that the available data are too meager to admit of any positive conclusions, but it seems the more probable that the use of high steam pressures

need not be attended by any considerable increase in the cost of repairs.

Tests Upon Locomotives at Different Pressures.

Tests under different steam pressures in the laboratory of Purdue University have involved two locomotives, which with the results obtained from them are briefly described as follows:

Schenectady No. 1 is an eight-wheeled engine, weighing 85,000 lbs. and having 17 by 24 inch cylinders.* Unpublished data embrace three tests of this locomotive, for which all conditions, excepting that of pressure, were the same. All three tests were run at a speed of, approximately, thirty-five miles an hour, at a cut-off of about one-third stroke, and with a wide-open throttle. These conditions of speed and cut-off were those which had previously been determined as giving the maximum efficiency. A summary of the data for these tests appears in Table II.

Table II.—Locomotive Schenectady No. 1 Under Different Pressures.

Miles per hour.	Boiler pressure by gage	Initial pressure from cards.	Increase of initial pressure.	Per cent. increase initial pres.	Indicated H. P.	Percentage increase of power.	Lbs. of steam per H. P. per hour.	Per cent. decrease in steam consumption.
35.0	98.4	91.5	....	..	300	....	28.8	..
35.3	131.7	115.6	24.1	26	435	45	26.3	9
35.2	143.3	137.3	21.7	19	522	20	24.9	5

NOTE.—The boiler pressure for the second test is in doubt. The initial pressures, however, are from cards which afford ample opportunities for verification, and for this reason the initial pressure is used as a basis for comparison in the table, rather than the boiler pressure. In each test the throttle was wide open and the reverse lever was placed at the second notch forward of center. The cut-off in per cent. of stroke was .32.

It appears from the table that changing the pressure from 91.5 lbs. to 115.6 lbs., an increase of 24 per cent., increases the power 45 per cent., and diminishes the weight of steam required per horse-power per hour 9 per cent. Again, changing the pressure from 115.6 lbs. to 137.3 lbs., an increase of 22 per cent., increases the power 20 per cent and reduces steam consumption 5 per cent. The steam consumption per horse-power per hour plotted in connection with a curve representing the performance of a perfect engine, appears in Fig. 1. The actual engine is represented by the curve a b, and the perfect engine by the curve A. B. This diagram emphasizes two important facts; first, that there is a reduction in the steam consumption of the actual engine, when the pressure is increased; and second, that the rate of change is very nearly proportional to the calculated rate of change for the perfect engine.

This latter relationship is important, since it is often assumed to be a general one, so that if the steam consumption for an engine at any pressure is known, its consumption for other pressures may be

The steam consumption of an actual locomotive is shown by the line a b, which is to be compared with the longer curve showing the consumption of steam by a perfect engine.

definitely calculated. The location of the curve a b, (Fig. 1), shows that the actual engine consumed about 50 per cent. more steam than would have been required by a perfect engine. This percentage is, approximately, constant within the limits of the experiments, and goes far to sustain the generally accepted theory already referred to.

Assuming that the relation of the steam consumption of an actual engine will bear a fixed relation to that of a perfect engine, we may extend the curve of performance given in Fig. 1. Such an assumption implies that had it been practicable to run higher pressures on Schenectady No. 1 without making any change in the proportions or adjustment of the engine, the steam consumption for the different pressures would have followed the line a c (Fig. 2), that is, with a boiler pressure of 150 lbs., the consumption would have been slightly in excess of 24 lbs. per H. P. per hour, while for 300 lbs. the consumption would have fallen below 20 lbs.

It is, however, to be noted that while theoretical considerations go far to justify dependence upon the curve a c, as representing the probable performance of the locomotive in question under different pressures, it is after all an assumed curve. The curve a b, Fig. 1, expresses a fact; the curve a c, Fig. 2, represents for a greater range of pressure a probable relationship.†

Schenectady No. 2.—It is evident that the maximum pressure which could be carried on Schenectady No. 1 was too low to admit of experiments under different pressures which could be depended upon to guide future practice. As a result of this condition and of a desire to further investigate the question of high pressures, as well as to give facilities for research along kindred lines, the Purdue authorities have recently provided a new locomotive, known as Schenectady No. 2†

†See Railroad Gazette, Dec. 17, 1897, for illustrated description.

This locomotive has a boiler of approximately the same dimensions with that of No. 1, but one which is capable of withstanding a working pressure of 250 lbs. The boiler is 52 in. in diameter, has 1,300 sq. ft. of heating surface, and 17 sq. ft. of grate surface. The cylinders at present in service are cast 20 in. in diameter by 24 in. stroke, and have valves and ports suited to these dimensions, but to adapt them to the work under discussion the cylinders were bushed to 16 in. diameter.

Tests were planned in six different series for which pressures of 90, 120, 150, 180, 210 and 240 lbs. were chosen. Each series was to consist of three tests for which the reverse lever was to be respectively in the third, sixth and tenth notches from the center forward, giving cut offs of, approximately, 25, 33 and 40 per cent. It will be seen that the plan provided for 18 tests for which the variables were pressure and cut-off. All other conditions were to be constant. The throttle was to be wide open, and the load for each test such as would hold the engine at a speed of 40 miles an hour.

The results, while entirely consistent one with another, and doubtless accurately representing the performance of the engine, are not in all respects such as were loked for. They show, as was expected, that the steam consumption is lowest when the pressure is increased, but they also show that the lowest steam consumption of Schenectady No. 2 was much in excess of that required by Schenectady No. 1. The best performance of No. 2 was below the best performance of No. 1, which was designed for a maximum pressure of 140 lbs.

This general result is to be traced chiefly to differences in cylinder design. As already noted, the cylinders of the new engine were cast 20 in. in diameter, with ports proportioned to this dimension, but for the present experiments bushings were inserted, reducing the effective diameter to 16 in. This arrangement gives an amount of cylinder clearance which is nearly 50 per cent. greater than that of the normal locomotive cylinder, and an area of surface bounding the clearance space which is very much larger than that which would bound the clearance space of a normal 16-in. cylinder. It happened, also, that the valve setting, while not bad for any test, could have been made better for those tests which were run under short cut-offs and higher steam pressures.

The data also justify the conclusion that any increase of pressures is not in itself a guarantee of improved performance. The improvement in performance which is to be expected from small increments of pressure is so small as to be quickly neutralized by any minor defect of design or of mechanism. This fact is expressed graphically by Fig. 2, in which the curve a c may be accepted as representing the best performance to be expected from any simple locomotive, while a d is a line of constant steam consumption. No ordinary locomotive, when working under most efficient conditions, should be expected to require more steam than is indicated by this line. It is fair to assume, therefore, that the weight of steam per horse power per hour required by an ordinary simple engine, in good order, when working under most efficient conditions will, if plotted with boiler pressure, fall within the shaded area of Fig. 2.

Concerning the behavior of engine and boiler under high pressures, it should be said that no difficulty arising from defective lubrication of valves, or from any other cause which might be attributed to the employment of high pressures, was experienced in running tests of 100 miles with no stop, and with the throttle always wide open, under a boiler pressure of 240 lbs. The work at all times proceeded with regularity.

Pressure vs. Capacity.

It may be assumed that the efficiency of a locomotive may be increased either by increasing the pressure on the boiler or by increasing the size or capacity of the boiler. If the pressure is increased, the gain is to be found in the improved performance of the engines; if the pressures remain unchanged and the boiler is made larger, its evaporative efficiency, when developing a given power, will be increased. Either an increase in pressure or an increase of capacity involves greater weight, and as the cost of a boiler of any given type will be approximately proportional to its weight, the whole question may be resolved into the following statement, namely: Shall any added weight which may be given the boiler of a locomotive be devoted to increasing its strength that a higher pressure may be carried, or to increasing its capacity that it may render its service while working at a correspondingly lower rate of power?

Fig. 1.

Fig. 2.

Fig. 3.

Effect of High-Pressure Steam for Locomotives.

Table III.—Showing Change in Weight of Boiler with Steam Pressure.

Steam Pressure. I.	W. of 60-in. Boiler. II.	W. of 52-in. Boiler. III.
140	.....	21,035
150	33,121	.....
180	35,253	.....
210	38,513	.....
240	39,035	.....
250	.....	25,775

Pressure and Weight of Boiler.—Table III. gives, in column 2, the weight of a 60-in. boiler suitable for a Mogul, or ten-wheeled engine designed for different pressures varying from 150 to 240 lbs. The values given in this column are estimates supplied through the courtesy of the Baldwin Locomotive Works. Column 3 of the same table gives weights of the boilers of the Purdue experimental locomotives, No. 1 and No. 2 respectively, which are in every way similar, excepting that one was designed for a pressure of 140 lbs., and the other for a pressure of 250 lbs.

It will be seen that an increase in steam pressure from 150 to 240 lbs. in a 60-in. boiler necessitates an increase in weight of 5,900 lbs., or of 18 per cent., and that an increase in steam pressure from 140 to 250 lbs. in a 52-in. boiler necessitates an increase in weight of 4,700 lbs., or of 22 per cent. It will, therefore, be sufficiently accurate for our purpose to assume that a change of pressure from 150 lbs. to 240 lbs., an increase of 90 lbs., will necessitate an increase in weight of boiler of about 20 per cent. The benefit to be derived from such an increase of pressure may be judged by reference to other portions of this report. We may next inquire as to the probable effect of converting the 20 per cent. increase in weight into increase in capacity.

Efficiency and Capacity.—The evaporative efficiency of a boiler depends on the rate of power to which the boiler is worked. The relation of efficiency and power, as defined by a large number of tests made upon the boiler of Schenectady No. 1, at Purdue, is shown by Fig. 3. It will be seen that when the power is such as will require 5 lbs. of water to be evaporated per foot of heating surface per hour; 8½ lbs. are evaporated for each pound of coal burned; but when 15 lbs. of water must be evaporated per foot of heating surface per hour, only 5½ lbs. are evaporated per pound of coal. Strictly speaking, the relationships disclosed by Fig. 3 apply only to the boiler from which they were derived, but as all locomotive boilers of usual form may be expected to give a curve of the same general character, that which is presented may be employed as the basis of the following general illustration. Thus, suppose that the demand for steam upon what may be called a "normal" boiler is such as to require the boiler to work at the point a on the curve of efficiency. If, now, the same demand for steam is supplied by a boiler whose heating surface is greater than that of the normal boiler, the larger boiler will work at some point, c, higher on the curve of efficiency; the increase in efficiency will be represented by the ratio of c d to a b. An inspection of the figure will show that the value of the ratio depends upon the length of the line d a and upon the location along the efficiency curve of the initial point a. That is, the increase in efficiency depends, first, on the amount of increase of heating surface, and, second, on the rate of evaporation of the assumed normal boiler.

It is perhaps fair to presume that the heating surface, or better, the steam-making capacity, of a boiler of any given type may, within limits, be proportional to its weight. The improvements in efficiency recorded in Table II. are such as may be expected to result from such an increase of size as would produce a 20 per cent. increase in weight, the boiler pressure remaining the same. These values compared favorably with the possible gain in efficiency to be derived from an increase of pressure alone, and while the gain from increased pressure must for the present remain a matter of some speculation and doubt, that which is to be had through increased capacity is both certain and fixed.

Master Mechanics's Convention.

The thirty-first annual meeting of the American Railway Master Mechanics' Association was opened at 9 o'clock, Monday, June 20, at the Saratoga Theater, Saratoga Springs, N. Y. President Leeds in his opening address took up the question of consolidating the Master Car Builders' and Master Mechanics' associations and advanced the opinion that as the interests of both were identical, they should be combined, a single organization being much stronger than the two present ones. It was also recommended that steps be taken to conduct an extensive series of locomotive road tests to determine the relative fitness of the various types of engines for different classes of service.

The report of the Secretary showed that at the beginning of the year there were 576 active members, 26 honorary members, and 17 associate members; at the present time the active members number 598, the honorary members 26, and the associate members 18, making a total of 642, or a gain of 23. One scholarship at Steven's Institute is now vacant. Messrs. M. M. Forney, E. L. Coster, J. I. Kinsey and James Maglenn were elected honorary members.

Messrs. J. H. Setchell, Peter H. Peck and A. M. Waitt were appointed as a committee to consider the recommendations given in the President's address.

The reports of committees were next taken up. These are printed either in full or in abstract in another part of this issue.

Tonnage Rating for Locomotives, Mr. G. R. Henderson, Chairman.

Mr. Marshall: I would ask Mr. Henderson to what extent he would think it advisable to adopt the method of actually weighing the cars to obtain the tonnage?

Mr. Henderson: Several of the railroad companies prefer actual weighing. Sometimes that cannot be done, as it may be the scales are not convenient to the point where the train is made up. One of our divisions has an arrangement to weigh the cars and load the engine in proportion. We have often found the actual weight in excess of the estimated weight. Where it is possible, it is much better to use the actual weights, and where that cannot be done, you must do the best you can.

Mr. Manchester: We found in making a number of tests with a dynamometer car that the profile failed to indicate certain draft strains that showed upon the dynamometer car, and we found in comparing the results obtained with a dynamometer car with the profile, as originally made 10 or 15 years ago, that the elevations and curvatures had all been

*See Railroad Gazette, May 20 and Oct. 7, 1892; Aug. 25, 1893; June 5, July 3 and Sept. 18, 1896.

†Assuming that at a pressure of 138 lbs. an actual engine requires 24.8 lbs. of steam per horse-power per hour, the amount which a similar engine will require when supplied with steam at higher pressures will, if plotted on this diagram, fall within the shaded area a d c.

changed, so that in fact the profile was a poor guide to go by.

Mr. Forsyth: I agree with Mr. Manchester in that the profile introduces another variable condition to the six items, which Mr. Henderson mentioned in his paper as necessary for a theoretical determination of tonnage rates. There is another variable which is hard to measure and which is not taken account of, and that is the speed. In any theoretical determination the value of momentum depends on the square of the speed, so that any slight variation of speed or any errors in the knowledge of the true speed, make a great difference in the final results.

Mr. Humphrey: We not only rate engines on the up-grade through the Rocky Mountain regions, but we rate them on the down grade as well, using the same basis in descending as we do in ascending. We arrive at the rate basis by taking the actual weight of the cars as nearly as possible, that is the way-bill rate. We have an arbitrary weight for different classes of cars. A 50,000 capacity box car we estimate approximately as 26,000 lbs., or 13 tons. A refrigerator car is rated at 21 tons. A coal car at 11 tons and a flat car at 9 tons, so that we take the total number of cars in the train and get the total amount of the rating. Then, by adding the lading, we find out how many cars it would make at the rate of 50 tons to the car, and then we figure that many loaded cars at the rate of 50 tons. We found the friction around the curves on an empty car was equal to five tons more than a loaded car, so that in all empty cars we add five tons for friction. In this way we arrive at the actual tonnage in the train and do not permit any train to go over the road that is not loaded as near the maximum rating of the engines, generally three engine train, as it is possible to get them.

Mr. Henderson: While we have not used the word "profile," yet under the head of resistance of trains, it is included. We could not overlook the profile and curvature of a road. They are very important matters.

"Best Methods of Boiler and Cylinder Insulation."

Mr. Wagner: The manner of covering the pipe laggings is something important. The outside covering of canvas, where exposed to the action of gases, is liable to decay. A little more expensive method, but much more satisfactory, is to cover it with thin sheet iron made up in sections 24 or 26 in. long, and rolled to the proper diameter, closed by two buckles. It is very easily made and is lasting, and where it is subjected to acid, water or fumes, when painted, gives good service.

Mr. Hibbard: I notice the report neglects that portion of the locomotive where heat may be lost in the saddle castings. Particularly is this important in the anthracite burning locomotives with a high saddle.

The best method is that which has been used by the Pennsylvania Railroad with the class L engines in which the walls of the steam passage are separated from all other cast iron walls by an air space about 2 in. thick. The steam pipe does not touch any portions of the saddle casting between the end of the branch pipe in the smoke box and the cylinder casting. The spaces about the steam pipe walls are filled with loose asbestos or other material which will prevent circulation of air, and the under side of the saddle casting is covered with wood to prevent circulation of air up from underneath the saddle casting.

Mr. Gaines: We tested on the Lehigh Valley Railroad several mineral coverings, one vegetable and the common wooding lagging. Ten ft. of 3-in. pipe cover of each kind was tested, making 3 trials of 5 hours each. The loss per hour, per square foot of surface, per degree difference in temperature, in British thermal units, was found to be as follows:

.36 B. T. U. for best mineral.
.64 B. T. U. for worst mineral.
1.93 B. T. U. for wood.

The results showed that the best covering saves over wood, after reducting 6 per cent interest on first cost of application, and 10 per cent depreciation, $54.98 a year in fuel and saves over the second best $14.96. The test has shown that there is not only a large saving in using a mineral cover, but it also pays well to use the best. The price of fuel varies on different parts of the line—from 80 cents to $1.50 a ton, which is probably the highest priced coal used in the freight engines. As a rule it is a mixture of buckwheat and soft coal.

Mr. Quayle: We use for boiler covering equal parts of asbestos, slack lime and sawdust; the lime being slacked for 72 hours before it is used. On high pressure boilers we claim that sawdust becomes more efficient after it is used for some time, for the reason that it becomes charred, and as a result, we have little air cells through it, which makes an excellent non-conductor. In covering boilers, my experience has taught me that we must have our boilers covered at the front end, and have this properly adhere to the boiler whatever covering you put on, and for that reason I have not been an advocate of sectional coverings, although I presume that the majority present will not agree with me. If we allow the front end of the boiler in any manner to admit air under the covering, the heat is carried off into the cab; but if you put on the plaster covering, it adheres to the boiler and the air cannot pass under it or through it when the engine is in high winds. There is no question in my mind but what superior non-conducting quality of material used on locomotive boilers will give you the maximum results in operation, but if the covering is improperly put on, this result will not follow and the air will carry off heat from the boiler when it ought to be retained. In my mind it is not a question so much of what is lost by radiation, as what is lost by being carried off at high velocities, and for that reason alone, I am an advocate of a plastic covering, and if I were to resort to the magnesia covering, I should advocate using it in a plastic form rather than as a sectional covering.

Mr. T. R. Brown: On the Pennsylvania Railroad we have used sectional covering for several years, and apply it to all new engines and when that sectional covering is put on it fits tightly and is made to suit the boiler. On such portions of the boiler as it is not practicable to make it fit satisfactorily, we put it on in the form of mud or plaster, drawing over the hip corner and that portion of the smoke box connections to the front barrel, where there is a large ring in our new design of engines. It would be very thin if you put it on in section. I think very little air can pass through the lagging on the boiler or between it and the sheets. It is put on connected with wires which hold it in place. After it is all completed it is held with bands of soft iron about ⅝ of an inch wide.

Mr. Marshall: I think the results reported in Figs. 1 and 2 are far from accurate. In looking at Fig. 2, you will see that all the curves have a tendency to flatten and to become horizontal as the test progresses, showing that the loss in radiation from the air in the room has seriously affected the results. The inaccuracy of the test would seem to be borne out by the fact that wood lagging is apparently one of the best from these results.

Mr. McIntosh: In regard to the inaccuracies suggested by Mr. Marshall to the best of my recollection the wood lagging did not show up nearly as well as is represented in the report.

The topical discussions were next taken up.

"The Special Apprentice."

Mr. Robert Quayle: The special apprentice is one who is supposed to come well equipped from some technical school. Let me call the attention of the Master Mechanics to the great advantage accruing to the officer having such men in his employ. We give them to understand thoroughly, that only on their merits are they expected to succeed. The last one who comes in, if he is the superior man, is passed at once ahead of the others who have been there a longer period. He must not only have his technical training, he must have ability to apply that technical training practically in the shops, and he must have fitness for the work that he has in hand, and he must evidence to us, by his ability, that he has not only the courage, not only the skill, but the ability to handle men. We find they are of great value to us in our test department, and it relieves the head of the department a great deal sometimes in having a man in whom he has confidence.

"Is It Possible to Arrange the Front Ends of Locomotives so They Will Clear Themselves of Cinders Without Throwing Sparks?"

Mr. McConnell: In the arrangement of the front end of locomotives to prevent them from throwing sparks, and clear themselves of cinders, it depends a great deal upon the kind of fuel used. On some roads where you have a strong bituminous coal with a coarse netting or perforated grate, with large openings, and run the diaphragm pretty well up into the bottom of the smoke box, if the engines steam freely, they will clean the front end and still not throw any fire. Where you use a lignite coal, it is a difficult matter to have the engine clean the front end under steam and not throw fire. Some years ago on our road we had the extension fronts, and that season we had considerable difficulty with them on account of burning the Wyoming coal, which is lignite in character, and it was found advisable after five years' experience to remove the extension fronts and equip the engines with the ordinary front end and diamond stack. At present we are getting good results, running a large nozzle, steaming freely and we do not have much trouble with fire.

Mr. Henderson: The Norfolk & Western Railroad Company uses a low nozzle with the diaphragm brought down back of the steam pipe, and then run off horizontally with a netting confined to the extension. There are a couple of petticoat pipes which equalize the draft, and it is important to get the lower petticoat pipe down close to the level of the solid diaphragm sheet. We have no fires reported now. The action of the arrangement seems to be when the blast is heavy to grind up the cinders and drive them through. The engines run two or three weeks without being cleaned, and probably then there is only a hatful of cinders in the smoke box.

Mr. Stewart: I think to accomplish this completely is an impossibility. An engine can be made, however, so that it will throw no sparks after the train has been once started. That is not due entirely to the arrangement of the front end of the engine to prevent throwing sparks. I never allow a fireman to close a furnace door. We run our furnace doors on the lags, with an opening of 2 or 3 in. All of our engines clean themselves thoroughly, but I have not an engine but what can be filled up at any time by poor firing. It is a question of the education of the fireman. I think if we look closer into that we will have less trouble with fires and the filling up of front ends.

Mr. David Brown: I believe the Delaware, Lackawanna & Western is the only road using anthracite coal alone. When we started out with the extension fronts some years ago, they were not a success and were discarded. We got at the matter again three or four times, and finally, about 1891, we felt that we had to make a success of it. We did as other people have done, made a long smoke box, but we found that did not work. We shortened it up as much as possible, so that now the smoke box is as short as possible, simply allowing a casting in front of the cylinder saddle to get out the ashes. By using the short smoke box, there is no large amount of ashes left. We have a heavy mountainous road, and the engines work very hard. We are doing very well with it, we have some engines running with nozzles 3½ in., double nozzles, and you might say that none of the engines using fine coal, buckwheat, run with less than 3-in. nozzles. We use double nozzles altogether. As to the arrangement of our netting, we use a low nozzle about 18 or 20 in. high; we bring the deflecting plate down to where the nozzle is put on top of the exhaust pipe proper. We run the netting between the two joints so that the netting is between. In some cases we use a plate below that, back of the exhaust pipe. At other times we put a plate in front of the exhaust pipe.

Mr. Smith: We have put an apparatus in the smoke box, which we call a smoke destroyer and vacuum producer. We do away with the ordinary exhaust pipe, and by the action of steam discharged through a peculiarly formed head in this smoke box we destroy nearly all smoke, relieve all back pressure and produce a vacuum assisting the pull of the piston. In hauling the heaviest trains on the Pittsburgh & Lake Erie Railroad, we have never thrown any fire out of the chimney, make comparatively no noise, and leave no cinders in the smoke box. The locomotives have been running in the neighborhood of three months, and we get the same results every day, and the company has given me orders to fit up more engines on the same plan, which I am doing at the present time.

High Jinks on the Congo.

There is to be a celebration of the opening of the Congo Railroad which reminds one of the days of the Crédit Mobilier and the excursions to celebrate the completion of various sections of the Union Pacific. The European invited guests were to rendezvous at Antwerp, and a special steamer was provided to carry them thence June 11, touching at Lisbon on the 15th, Madeira the 18th, and, if the little war in Sierra Leone is ended by that time, the vessel will first touch the African coast at Free Town. The next landings will be Libreville in French Congo, and Karbinda in Portuguese Congo.

The western capital of the railroad, at Boma, is to be reached July 1, the thirteenth anniversary of the founding of the Congo Free State. This event will be celebrated at Boma with a military parade, a Te Deum, and a breakfast, immediately after which the guests will steam up the river to the western terminus of the railroad at Matadi, where they will dine and be entertained with fireworks. On the 2d there are to be excursions to the points of interest about Matadi, including the famous Mpozo gorge, and the ascent of a hill from which there is a view for thirty miles around. It is also proposed to take the guests (if they will go) over a few miles of the old caravan route, that they may have a realizing sense of the horrors which the railroad has put an end to. July 3 the party takes the train, stopping at two points on the way to admire the great bridges, and arriving at Tumba, the half-way station, at 5 p. m., where the railroad company has put up sleeping cabins and a great dining hall for the occasion. July 4 the train carries the party over the rest of the road to Stanley Pool, where sleeping accommodations will be provided in the state building, the Dutch factory, the Belgian trading company, by the Catholic bishop and the English missionaries. July 5 the guests will embark on the Upper Congo flotilla, and make the circuit of the pool, which is a considerable lake. In the evening the state will entertain its guests at a grand banquet, with an illumination of the pool and fireworks, and send them to their several lodgings by special trains.

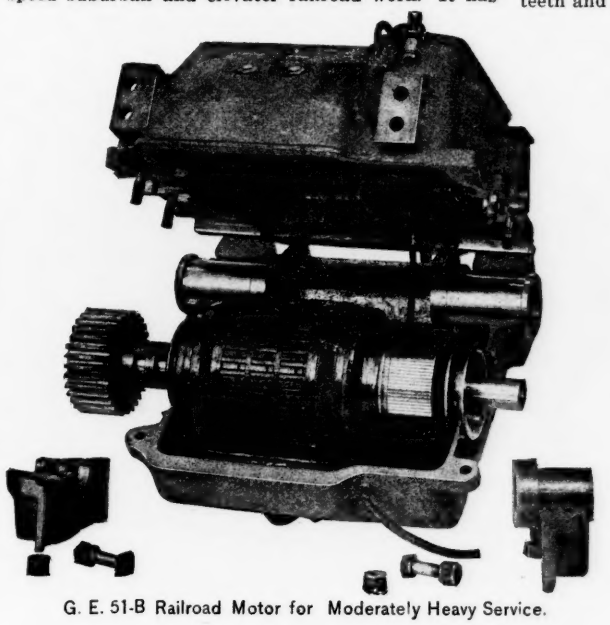
The next day the return trip begins, and the final banquet will be given at Matadi, July 7. At Boma the natives will drill and exhibit their games, and the Governor will give a farewell banquet (the one in Matadi is the railroad company's). The same afternoon they will embark on their ocean steamer, touch at the Island of St. Paul de Loanda, at St. Helena, where a stay of twenty-four hours will be made to cut willow twigs, and at the Azores forty-eight hours will be given to recover from headaches

caused by the African heats, or otherwise. Then the course is to be direct to Havre and Antwerp, and at the latter city, probably about the 9th of August, the city authorities will give a reception.

This, for Darkest Africa, is doing pretty well; but is it doubtful if it will conduce to the telling of the truth and nothing but the truth about the African enterprise. At least that was not the case with similar junketings when the Union Pacific was built.

The G. E. 51-B. Electric Motor for Heavy Railroad Service.

This motor has been designed especially for high speed suburban and elevater railroad work. It has



G. E. 51-B Railroad Motor for Moderately Heavy Service.

a capacity of 80 H. P., based on a rating of a rise in temperature of the windings of 75 degs. Centigrade above that of the surrounding atmosphere after one hour's run at rated load. It is calculated that a double G. E. 51-B motor equipment, with the gear ratio of 1 to 2.27, will run a 20-ton car well loaded at a maximum speed of 26 miles an nour on a level track. Higher or lower gear ratios may be used for different speeds and loads.

The frame of the G. E., 51-B is of cast steel made in two bowl-shaped halves bolted together. It completely protects the working parts of the motor from mechanical injury and the action of wate|r or dust. The upper casting has a large opening, permitting an inspection of the commutator and brush holders, and the replacement of the brushes. This is covered with a dust proof plate, which can be easily removed by turning a cam locking device. A hand hole, also fitted with a weather-proof cover plate, let into the lower frame at the commutator end, facilitates the removal of any foreign substance in the bottom of the motor.

The motor has four laminated pole pieces with projections supporting the coils, which are slipped over them. They are secured by bolts passing through the frame and fastened with nuts on the outside. The bearings have been given ample proportions to insure good lubrication and long life. The upper support of the linings of the armature bearing is part of the upper half of the motor frame; the lower support is a cap bolted to the upper support. The armature can thus be held in the upper half of the motor, while the lower half only is lowered. To remove the armature it may be lowered with the lower half. The cored recess between the inner ends of the lining and the motor frame is occupied by a combination thrust collar and oil guard, an open space at the bottom being left to give free outlet to oil or grease. With this construction it is impossible for oil or grease to work its way into the motor or come into contact with the windings. The upper supports of the linings are provided with large grease boxes, and the lower are cored, leaving a recess for the oil. Felt wicks or wipers come in contact with the shaft through openings in the lining, and convey a continuous supply of oil to it. The linings of the armature bearings are cylindrical in form, made of cast-iron and babitted, and are held in place by dowels in the lower support. The axle bearing linings are held in place by the upper and lower halves of the frame, extending back and enveloping the car axle. They are made of composite bearing metal lubricated by oily waste held in an oil well and pressed against the outside of the axle by a leaf spring. The commutator end of the armature is 6¾x3 in.; pinion end, 9½x3¼ in. The axle bearings are 9 in. long with diameter corresponding to the size of the axle.

The field coils are of copper ribbon wound on metal spools and insulated between turns with asbestos. The coils are thoroughly insulated from the spools with specially prepared mica, canvas cloth and press board.

The armature is of the iron-clad, hollow core type, 16 in. in diameter and 10½ in. long. The core is built up of well annealed laminations provided with ventilating ducts, as in the armature of the G. E. railroad generators, the laminations being assembled directly on the shaft and not on a separate spider. The core has 37 slots, each slot containing three insulated coils laid together in one compact unit. This gives the armature 37 sets of coils with 111 leads, corresponding to the number of bars in the commutator. All coils are formed and insulated before application to the core, the small number facilitating repairs, while the method of grouping them permits the use of substantial insulation. This is of the highest grade, and shipment of armatures poorly insulated is prevented by giving each a thorough test with 2,500 volts alternating current.

The pinion is made of cast steel with machine cut teeth and bored for a taper fit on the armature shaft. Both gears and pinions are made at the General Electric Company's gear plant at Lynn.

The commutator is 11⅝ in. in diameter, with 111 segments built up with alternating layers of mica insulation and securely clamped on a malleable iron shell. The segments are of the best hard drawn copper 6⅛ in. long with a wearing depth of 1 in. The mica cone insulations used in assembling the commutator are built up and compressed into moulds, making them hard and compact, and the mica between the segments is especially selected with a view of giving it a degree of hardness that will make it wear evenly with the copper segments. To insure perfect insulation every commutator is tested with 500 volts direct current between adjacent segments, and 5,000 volts alternating between the segments and the shell.

The brush holders are of cast brass and each is arranged to hold two carbon brushes which slide in finished ways and are pressed against the commutator by independent pressure fingers, giving a uniform pressure throughout the whole working length of the brushes. The brush-holders are off-set ¼ in. to prevent the wearing of grooves in the commutator and are clamped to a well seasoned hard wood yoke filled with moisture proof compound bolted to the top magnet frame and easily removable through the opening over the commutator.

Mounted on 33-in. wheels the clearance between the bottom of the frame and rails is 3 in. That between the bottom of the gear case and rail is 4 in.

Train Accidents in the United States in May.

COLLISIONS.

Rear.

2d, 11 p. m. on Philadelphia & Reading, near Tamaqua, Pa., a freight train descending a grade broke in two and the rear portion afterward ran into the forward one, wrecking 12 cars of coal and the bridge over the Schuylkill River, near which the collision occurred.

5th, 2 a. m., on Norfolk & Western, at Bedford City, Va., a freight train ascending a grade broke in two, and 22 cars of coal ran back into the head of a following freight, which was drawn by two engines. Both engines and 8 cars were wrecked. One fireman was killed and 1 engineman was injured.

6th, 8 p. m., on Florida, Central & Peninsular, near Jacksonville, Fla., a passenger train ran over a misplaced switch and into some freight cars standing on the side track, badly damaging the engine and several freight cars. The engineman was killed and the fireman and mail agent were injured.

16th, on Louisville, Evansville & St. Louis, at English, Ind., a freight train ran into the rear of a preceding freight and a brakeman was injured.

19th, 3 a. m., on Pennsylvania road, near Sheridan, Pa., a freight train ran into the rear of a preceding freight, wrecking 2 cars and a caboose. A brakeman sleeping in the caboose was killed. It is said that the second train ran past a semaphore signal which was set against it.

19th, on Cleveland, Cincinnati, Chicago & St. Louis, at Bellefontaine, O., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking several cars. Two tramps were injured.

19th, on Cincinnati, Hamilton & Dayton, at Chilicothe, O., a freight train ran over a misplaced switch and into a string of cars standing on the side track, damaging the engine and 6 cars. The engineman was injured.

19th, 11 p. m., on Chicago, Milwaukee & St. Paul, near Elgin, Ill., a passenger train ran over a misplaced switch and into the rear of a freight train standing on the side track, wrecking the engine; engineman and fireman injured.

21st, on Chattanooga, Rome & Southern, near Rossville, Tenn., a train carrying troops which was stopped by a blockade of other trains was run into at the rear by a regular passenger train, wrecking the rear car, which was a baggage car, loaded with horses, in which were several attendants. One soldier was killed and 6 were injured, 2 probably fatally. All the victims were in the horse car.

23d, on Baltimore & Ohio, at Lodi, O., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking 10 cars. Three of the cars contained matches, which set fire to the wreck, and two cars were burned up. The conductor was injured.

29th, on Sioux City & Pacific, near Blair, Neb., a freight train which had been delayed by an accident was run into at the rear by a following passenger train, and the engine, baggage car and mail car were derailed and damaged. The engineman of the passenger train was killed and the fireman was fatally injured. Two mail clerks were also injured. It is said that the conductor of the freight train had been crippled by the accident to his car, so that he could not go back to signal the passenger train.

And 15 others on 12 roads, involving 1 passenger train and 23 freight and other trains.

Butting.

6th, 5 a. m., on Chicago, Burlington & Quincy, near Whitebreast, Ia., butting collision between a west bound freight and east bound passenger train, badly damaging both engines and 15 freight cars. The wreck took fire and most of the freight cars were burned up. A tramp who was stealing a ride was fatally injured, and the passenger engineman was seriously injured.

7th, on Lehigh Valley, at Espy Run, Pa., butting collision between an east bound passenger train and a west bound freight engine, the engineman of the latter having forgotten about the passenger train. Seven passengers were slightly injured.

13th, on Missouri Pacific, near Jefferson City, Mo., butting collision between passenger train No. 4 and an empty engine, derailing both engines. The passenger engineman was fatally scalded and the other engineman and 2 passengers were injured. It is said that the engineman of the empty engine misread a telegraphic order.

13th, on Santa Fe Pacific, at El Rito, N. M., butting collision of freight trains 33 and 34, wrecking both engines and several cars; 3 trainmen injured.

14th, on Fitchburg road, near Hoosac Tunnel, Mass., butting collision of freight trains, damaging both engines and a car of live stock; one brakeman injured. It is said that on account of a previous derailment both east bound and west bound trains had to be run over the same track and that one of the trains approached the end of the double track at uncontrollable speed.

20th, 4 a. m., on Pennsylvania road, at Allenport, Pa., butting collision of freight trains, wrecking both engines. It is said that the north bound train failed to stop for an order which was waiting for it at Lucyville, on account of the breakage of a signal lamp.

20th, on Louisville & Nashville, near Gallatin, Tenn., butting collision of freight trains, badly damaging both engines. One engineman was injured. It is said that an operator failed to deliver an order to one of the trains.

21st, on Vandalia Line, at Formosa, Ill., butting collision between a special train carrying officers of the road and a work train, the caboose of the latter being foremost. Four employees in the caboose were killed and 20 were injured.

23d, 1 a. m., on Louisville & Nashville, at Elizabethtown, Ky., butting collision between a freight train and an empty engine, wrecking both engines and 17 cars. Four trainmen were injured.

23d, 5 a. m., on Florida Central & Peninsular, near Way's, Ga., butting collision between a southbound train carrying soldiers and a northbound fast freight train. One soldier was killed and another was fatally injured. It is said that the crew of the northbound train waiting on the side track at Way's for special southbound passenger trains neglected to note the signals and assumed that all of the trains had passed when one of them was yet to come. Most or all of the crew of the freight slept while they waited.

27th, on Cincinnati, New Orleans & Texas Pacific, at Graysville, Tenn., butting collision between a passenger train and an empty freight engine, making a bad wreck. All the 5 men on the freight engine were killed, or fatally injured, and 2 employees on the passenger train were injured.

31st, 4 a. m., on Pittsburg, Ft. Wayne & Chicago, near Elida, O., west bound passenger train No. 5 ran into east bound freight train No. 78, badly damaging both engines and wrecking a dozen freight cars. The fireman of the freight was injured. It is said that the passenger train had just passed from double to single track, and that the men in charge of the freight claim to have had two minutes more in which to reach the double track. There was a dense fog at the time.

31st, on Kansas City, Pittsburgh & Gulf, near Decatur, Ark., butting collision of freight trains, one of which was running at high speed. Both engines and many cars were wrecked. One fireman was killed and 2 trainmen were injured.

And 7 others on 7 roads, involving 3 passenger and 11 freight and other trains.

Crossing and Miscellaneous.

6th, on Pennsylvania road, at South Bristol, Pa., the west bound Chicago Limited express ran into a work train which was on the main track at a crossover, wrecking the engine and 4 platform cars of the work train and damaging the engine and first two cars of the passenger train. The passenger train was running at nearly full speed, but the cars, all vestibuled, remained upright and none of their occupants were injured. The engineman and fireman were badly injured.

7th, on Erie road, at Akron, O., collision of switching engines; 1 engineman injured.

9th, 3 a. m., on Erie road, at Port Jervis, N. Y., a caboose, being switched at the entrance of the yard, was crushed between 2 engines, and 2 trainmen were injured.

13th, on Cleveland, Cincinnati, Chicago & St. Louis, near Middletown, O., collision between a train of new vestibuled passenger cars belonging to the Chicago, Milwaukee & St. Paul and a switching engine. The switcher was overturned and the front end of the baggage car was badly damaged. A fireman was injured.

17th, on Lehigh Valley, at Lehighton, Pa., an engine ran over a misplaced switch and into a string of 7 cabooses, damaging the cabooses and injuring 8 trainmen, who were lying in them asleep.

22d, at Spring Grove avenue, Cincinnati, a passenger train of the Cleveland, Cincinnati, Chicago & St. Louis collided with a switching engine of the Baltimore & Ohio Southwestern, doing slight damage. The switching engine, having been deserted, ran unattended to Norwood, several miles. Two trainmen and 1 passenger were injured.

25th, 2 a. m., on Chicago & Alton, at Pontiac, Ill., a passenger train ran into a freight train switching on the main track, badly damaging the engine and ten freight cars. The engineman and several passengers were slightly injured. Two tramps riding in a stock car were injured.

25th, on Pennsylvania road, at Milton, Pa., collision between a passenger train and a freight; 1 engineman injured.

And 14 others on 13 roads, involving 1 passenger train and 25 freight and other trains.

DERAILMENTS.

Defects of Road.

18th, on Zanesville & Ohio River, near Waterford, O., a passenger train broke through a trestle and two passenger cars fell down about 9 ft.

23d, on Santa Fe Pacific, near Holbrook, N. M., a freight train broke through a bridge and the engine

(*Continued on page* 460.)

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

At the time of the famine in Russia, after the harvest of 1891, there was an abundant crop in South Russia, and its surplus was sufficient to supply the wants of the districts where the crop was short. To make sure that it should do so the government prohibited the exportation of rye immediately after harvest, and later of all grains. But as time passed, it became evident that the railroads were not carrying the grain to the suffering districts as fast as it was required. On one railroad 6,397 car-loads of grain had accumulated at the stations awaiting shipment Aug. 1, and this quantity grew to 7,741 car-loads Sept. 1, to 9,960 Oct. 1, and to 11,525 Nov. 1, while people were actually starving at the places to which the grain was consigned. In hopes that transportation might then be effected more promptly, the Czar ordered a Colonel von Wendrick to take charge of all the railroads connecting the famine districts with the country where there was a surplus, with unlimited powers, and instruction to forward 36,000,000 bushels of grain as quickly as possible. This officer took charge in December and continued to manage the railroads till March. In 1896 his report of his administration was published. His description of the condition of things on these railroads as he found it would hardly be credible if it came from any other source. The locomotives had been allowed to run down so that when the heavy grain movement began they failed rapidly. On one railroad two-fifths of the whole stock of locomotives had to be withdrawn from service in 1890 and another two-fifths in 1891. On one of the most important grain-carriers in Russia during March and April 40 per cent. of the locomotives were in the shops for repairs or waiting to get in. The trains were always behind time. Trains timed to pass over a certain division 71 miles long in nine hours were actually 35 hours in getting through. But the officers and employees seem to have been more incapable than the locomotives. On one line no official knew where empty cars were or where freight was waiting for them, and everything was done at the direction of station masters, who had no instructions whatever. And some of these were so incapable and ignorant of their business that they left everything to their subordinates. Not only were the officers incapable, but some of them were untrustworthy, and an instance is given of a superintendent who telegraphed Dec. 17 that he had fitted out an additional train as ordered, while Jan. 7 it was found that nothing whatever had been done about it. And yet there is no other country where the government control of railroads is so absolute as in Russia. We recommend this example of inefficiency in a great emergency for the careful study and prayerful meditation of railroad commissioners and socialistic senators. An ounce of actual human experience is worth a pound of "thoughts."

The Use of Locomotive Laboratory Experiments.

The benefit to be derived from locomotive laboratory experiments depends upon the man who has to apply the results to practice, and whether his training has been such as to enable him to understand the full significance of such data. The men who have to do with the motive power of our railroads are, to use the expressions of a recent writer, of "the hardheaded, practical type, who have had long experience in their occupations," and "those who have had the advantages of a technical education," but here and there will be found one of the first class who by hard work has held his own with the younger men in technical knowledge. The typical man of the practical type can see no reason why the loose methods used twenty or thirty years ago for comparing the performance of locomotives, which then resulted in improvements in locomotive building, are not good enough for the present. There are good reasons, however, and they have come about principally because the older men have done their work so well; the limit has been reached and the possibilities of former methods have largely been exhausted.

When all forms of mechanical construction were crude, it was possible to improve by the mere application of experience, but as construction becomes more and more refined, it is necessary to examine with greater accuracy and proceed with greater care as the possibilities for improvement become smaller. The crude stage in all branches of engineering is past, and each year increases the degree of refinement which must be used in engineering research, if improvement is to follow along intelligent lines. Experimental locomotive laboratories have been brought into existence because of this need of refinement, and so far have proved to be of practical as well as scientific value. They have put the study of locomotives on a higher plane.

But unfortunately for the average practical man, he cannot follow closely the growth of this study. Terms are used with which he is unfamiliar; theories are advanced to account for different phenomena which he does not comprehend, and naturally he cannot see the advantage of studying the action of a locomotive on a testing plant when locomotives are never so situated in service. The sum of the matter is, he looks with suspicion upon everything derived from laboratory data, while his "hard-headedness" stands in the way of his trying to get hold of the new conditions.

The best recommendation for the experimental laboratory is, that the younger generation look to it for accurate information, which they are able to apply intelligently to their practical problems. They have had sufficient experience to know that the variables which surround, for instance, road tests of modern locomotives render impossible any definite conclusions as to the effect of different methods of operation or construction on the efficiency of the machine as a whole. On the testing plant, however, the complicating conditions of service are eliminated and effects can be traced singly to their causes. This is the chief value of the locomotive testing plant, and it is neither claimed nor expected that it will give, directly, information as to the cost of repairs, the wearing qualities, or the life of the engine, but it offers the only means of determining with any accuracy how much work can be got under a fixed set of conditions from a given engine with a given amount of fuel. Improvements may also be indicated by laboratory research, eventually leading to a reduction in operating expenses, which would not be apparent from a similar study of the engine under service conditions. Such data are particularly valuable in designing engines similar to those tested, and for interpreting the performance of engines in service; and they form an accurate basis for reasoning about new designs. The data which have already been collected in the locomotive laboratories have largely been made public, and have had the effect of bringing some long-lived discussions to a close.

It might be well to point to the failure of the efforts of a number of years to determine the relative efficiency of compound and simple engines by means of comparative service tests. It has been impossible to get accurate data about the performance of compound locomotives, although both stationary and marine practice would indicate that compound cylinders are essential, if the benefits from high steam pressures are to be realized. This is only one of the questions which the laboratory can confidently be expected to settle. The time has passed when improvements of any consequence in locomotive building are likely to be indicated by service tests alone. Comparative service tests have their place, but the difference between the performance of two modern engines of the same weight is smaller than the errors arising in road tests from the variable conditions, leaving out of account the inaccuracy of measurements which cannot be avoided on the road.

The Cost of Curvature.

In answer to the question (on the first page of this issue) how much more money can be profitably expended in construction to secure tangent, over and above what would be required to build the line with more frequent curves, it is proper to assume that it is very difficult to assign any definite financial value to the item of comfort for the passenger.

It is possible to assign a definite value for the increase in cost of operation which may include the cost of maintenance of track and rolling stock. Wellington, in his "Economic Theory of Railway Location," has laid down the proper lines upon which such value should be determined. In matters of detail, it may be well not to follow the exact figures used by him. The consensus of opinion would seem to indicate that 0.05 for 1 deg. is the proper amount to allow for compensation on curves; or, in other words, this is the amount (as a fraction of a foot) by which the grade must be lowered for every 1 deg. of central angle. Wellington, in parts of his book, definitely uses this figure, but uses only half this in making his computation of the sum which can be profitably expended to save one degree of curvature.

Wellington's method, as is well known, is to investigate each item of expense in operating a railroad and to determine how much increase of cost will result on a curve sharp enough so that the level tangent resistance is doubled. Wellington uses nearly a 12-deg. curve. A 6-deg. curve seems more nearly correct, in view of the compensation referred to above. A mile of 6-deg. curve contains about 317 deg., and it is possible, following Wellington's general method, to determine how much additional cost will result where the entire mile is a 6-deg. curve. This will amount to about 30 cents, when the average cost of a train mile is $1.00; so that the cost of 1 deg. of curvature will be nearly $\frac{1}{10}$ cent per train mile, and the annual cost for one train a day each way will be 73 cents. At 4 per cent. interest, this represents a capitalized sum of $18.25. That is, on a road where the cost per train mile is $1.00, where there is one train each way daily, and interest is properly figured at 4 per cent., one can afford to spend $18.25 to save only 1 deg. of curvature, that is to save $\frac{1}{3\,4\,0}$ part of a circle. With ten trains a day, it will be reasonable to expend $182.50; with 25 trains a day each way, $456. If it is estimated that the cost per train mile will be only 80 cents, instead of $1.00, the proper figures to use will be $\frac{8}{10}$ of those given above.

Our knowledge of the subject is not sufficient to make a distinction between 1 deg. on a 6-deg. curve and 1 deg. on a 3-deg. curve, and it is of course true that the figures quoted cannot be claimed to show results that are unquestionably exact. In reaching them, the items taken are the average items for the United States under the census of 1880. It is also true that the proportion by which each item is effected by curvature is more or less a matter of judgment. Nevertheless, results reached in this way are the best guide we have and should be used in the absence of anything known to be better. Wellington's results based on a compensation of 0.025 are smaller. By his figures, with interest at 4 per cent., in order to save 1 deg. of curvature, one can afford to spend $10.83 per daily train each way when the cost per train mile is $1.00.

While considering this matter it seems proper that something should be said in relation to the comfort and safety of the passenger. As regards comfort simply, it is probable that there are very few railroads in the country where the passenger's comfort would be interfered with in passing over 6-deg. curves, if the proper elevation were given them and suitable easement curves were used. On the side of safety, something more can be said. It is certainly true that a curve is less safe than a tangent. In the case of a broken rail or of a broken wheel flange, the danger on a curve is far greater than on a tangent. It is further true that any derailment on a curve is likely to be attended with more serious results than on a tangent. It is also true that the danger of collision is greater where curves occur than on a tangent; so that altogether, while the danger of accidents on railroads is in any case wonderfully small, additional curves certainly do increase the danger in a material proportion, and this point ought not to be altogether lost sight of in location. Curves in certain special localities may increase the

danger very materially and should not be used if they can be avoided by the expenditure of a reasonable sum.

The proper procedure would appear to be to determine in the case of two lines, one with more curvature than the other, which is the cheaper line, taking into account the cost of building and the allowance to be made on account of the curvature, this depending upon the increase in the operating expenses and using substantially the figures given above. With this in hand, the engineer can determine, in view of convenience, safety, and any other considerations which may be involved, which line on the whole he prefers. In other words, the investigation as to the economy of the two lines should not be conclusive with the engineer. The element of economy is certainly a very important one and evidence of that sort should always be before the engineer to aid him in his decision, but he should finally reach his conclusion by the exercise of a sound engineering judgment, taking into account not merely the economy of the article, but also its quality; and in many cases a superior result will commend itself to him, even though the cost be somewhat greater, perhaps materially greater. A theoretical consideration of cost or economy is proper in all engineering matters, but the final result should depend upon the good judgment of the engineer and not be controlled by any single element that enters into the case.

May Accidents.

Our record of train accidents in May, given in this number, includes 68 collisions, 76 derailments and 6 other accidents, a total of 150 accidents, in which 36 persons were killed and 138 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS.	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two	9	0	1	10
Misplaced switch	3	0	3	6
Failure to give or observe signal	4	1	2	7
Mistake in giving or understanding orders	0	3	0	3
Miscellaneous	3	5	3	11
Unexplained	7	11	13	31
Total	26	20	22	68

DERAILMENTS.

Broken rail	1	Too quick application of air-brakes	4
Loose or spread rail	3	Misplaced switch	3
Defective bridge	2	Track repairs	2
Broken wheel	2	Bad switching	4
Broken axle	7	Animals on track	2
Broken truck	4	Washout	1
Failure of drawbar	4	Malicious obstruction	1
Fallen brakebeam	1	Unexplained	34
Broken car	1		76

OTHER ACCIDENTS.

Boiler explosion	3
Explosion	1
Cars burned while running	1
Breakage of rolling stock	1
	6
Total number of accidents	150

A general classification shows:

	Collisions.	Derailments.	Other accid's.	Total.	P. c.
Defects of road	0	6	0	6	4
Defects of equipment	10	21	4	35	24
Negligence in operating	27	11	2	40	26
Unforeseen obstructions	0	4	0	4	3
Unexplained	31	34	0	65	43
Total	68	76	6	150	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other accid's.	Total.
Passenger	22	14	3	39
Freight and other	101	64	3	168
Total	123	78	6	207

The casualties may be divided as follows:

Killed:	Collisions.	Derailments.	Other accid's.	Total.
Employees	16	6	6	28
Passengers	3	1	0	4
Others	1	3	0	4
Total	20	10	6	36
Injured:				
Employees	65	12	1	78
Passengers	19	23	0	42
Others	7	11	0	18
Total	91	46	1	138

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road	0	1	0	0
Defects of equipment	0	0	6	0
Negligence in operating	3	21	16	68
Unforeseen obstructions and maliciousness	0	0	4	2
Unexplained	1	20	2	8
Total	4	42	28	78

Nineteen accidents caused the death of one or more persons each, and 34 caused injury but not death, leaving 97 (65 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with May of the previous five years shows:

	1898.	1897.	1896.	1895.	1894.	1893.
Collisions	68	33	34	47	42	68
Derailments	76	46	73	58	54	102
Other accidents	6	8	2	6	4	6
Total accidents	150	87	109	111	100	176
Employees killed	28	11	17	16	30	39
Others killed	8	5	15	9	4	27
Employees injured	78	17	39	62	70	94
Others injured	60	48	37	65	41	81
Passenger trains involved	39	27	25	34	41	49
Average per day:						
Accidents	4.84	2.80	3.52	3.58	3.23	5.68
Killed	1.16	0.84	1.03	0.81	1.10	2.13
Injured	0.45	2.10	2.45	4.10	3.58	5.65
Average per accident:						
Killed	0.24	0 18	0.29	0.22	0.34	0.37
Injured	0.92	0.74	0.70	1 14	1.11	0.99

The two most fatal passenger train accidents in May, those at Rossville, Tenn., and near Way's, Ga., have already been noticed in the Railroad Gazette (June 3, p. 392). Another military train came near being wrecked. Near Adamsville, Ala., on the night of the 22d, a train carrying a load of volunteers from Illinois ran over a burning trestle, but reached the further side in safety. The other principal passenger train accidents were the collisions at South Bristol, Pa., on the 6th, and near Jefferson City, Mo., on the 13th. At South Bristol the great strength of the passenger cars saved harmless all the people on the train behind the engine. The other case was a butting collision, said to be due to a mistake in giving or delivering orders. Near Formosa, Ill., on the 21st, there was a butting collision, in which four work-train men were killed in a caboose, this car being run at the forward end of the train. Legislators and others who are seeking to have employees of corporations cared for, as regards protection from danger, on the same basis as passengers or outsiders will naturally look upon a disaster like this as an illustrative example justifying their demands, and not without reason. Near Lucyville, Pa., a butting collision is said to have resulted from the breaking of a signal light, but why the familiar rule for such cases—that the absence of a light means danger—was not observed by the engineman in this instance is a point which is not explained.

We find six electric car accidents in May, three collisions and three derailments; in which eight persons were injured.

June Dividends.

The June railroad dividend declarations did not add any important company to the list of dividend payers, but they were noteworthy for the fact that quite a number of companies which have been paying dividends on their prior stock issues have put their second issues on a dividend basis, with prospects of continuing regular payments; several companies have increased their dividends, and a noteworthy feature is the fact that several of the reorganized properties have made important divisions of profits.

The dividend attracting most attention was that of the Rock Island Company. It is the largest company which has changed its rate and it declared the largest dividend, 1¼ per cent. cash and 10 per cent. in stock. Moreover, the actual declaration had been preceded by a bull movement in the stock which moved the price from 84¾ on April 30, to about 108 when the dividend was announced. An interesting post-dividend development has been the announcement that the larger cash dividend will be paid on the increased capital of $50,000,000. The Rock Island has paid a lower rate of dividend than most of the other granger roads during the long depression, but it has regularly paid something in each year. It is now on a 5 per cent. dividend basis along with the other important granger roads, the Burlington and the St. Paul, which have resumed payments at this rate within the last year, and the Northwestern, which has been paying that rate since 1895. After deducting the regular 7 per cent. on the preferred and 5 per cent. on the common, the Northwestern Company shows a balance, above all charges, in its preliminary income account for the fiscal year ending May 31, of $2,283,000, against $1,170,000 in 1897. The Rock Island Company, in its fiscal year, showed a surplus available for dividends of $3,322,000, against $1,444,000 in 1897.

The reorganized companies distributing increased profits to their shareholders this month are the St. Louis & San Francisco, the Oregon Railroad & Navigation Co., and the Minneapolis & St. Louis. All of these companies have been paying regular dividends on their prior stocks for some time past. The three first-named have now announced a payment on their second stock issues, while the Minneapolis & St. Louis, which paid three per cent. on its second preferred shares in 1896 and 1897, has now raised the annual rate to four per cent., the first preferred receiving five per cent., as before. The St. Louis & San Francisco has maintained four per cent. dividends on its preferred stock since 1896, when it was reorganized. This, however, has called for only $200,000 a year. A dividend on the second preferred is a larger affair, the issue being $16,000,000. But, as the company's revenue in the ten months of the fiscal year shows a surplus above the proportionate fixed charges of $600,000, or double the amount in 1897, the balance above the full first preferred dividend and the one per cent. in the second preferred is $246,000.

The Oregon Navigation Co. makes an equally good showing. It was reorganized in July, 1896, and a year later paid its first dividend, placing its preferred stock on a four per cent. basis. Now it has declared one per cent. on the common shares, which are largely held by the Oregon Short Line Co. Like all the Northwestern lines, its earnings in the past year have been specially heavy. In ten months to April 30 its gross was $1,872,000, or forty-seven per cent., over the 1897 figures, and the net income was over 2½ million dollars, and the net was more than half as large again as in the previous year.

The Chicago & Eastern Illinois, which has been able to maintain regular six per cent. dividends on its preferred shares through all the troubles of the soft coal interests of Illinois and Indiana, which give it about 65 per cent. of its total tonnage, has declared the first dividend, 2½ per cent., on the present issue of common stock. The Denver & Rio Grande also has increased its preferred dividend rate from three per cent. to four per cent. a year, and in the ten months ending April 30 reports a surplus of $750,000, against $395,000 in the same months in 1897. The January dividend of one per cent. and the present one of one and one-half per cent. call for $591,250, of about $159,000 less than has been earned, with two months of the fiscal year yet to come.

It must not be understood that all the railroads which are earning a surplus are distributing increased dividends. A number of companies which Wall Street has expected would declare dividends or increase their rates have failed to take that action. The Louisville & Nashville has delayed its long-expected dividend, and the anticipated Northern Pacific common dividend has not materialized.

The Paris "Figaro" describes a "Congressional train" which carries Senators, members of Congress and newspaper men free of charge daily between New York and Washington. It dwells on the luxurious parlor cars, smoking-room, library, restaurant car with palms and fountain and a negro orchestra, and enlarges on the reporters' car, in which the Washington correspondents sit at their desks and write their articles, supplied with books of reference and all the comforts and conveniences they could have at home or in the newspaper offices, while cigars and refreshments are brought to them at call. At every station is an apparatus which catches and delivers to the telegraph operator any "copy" the journalist may wish to telegraph to his newspaper, and another from which the car receives the latest dispatches for the journalist, who, on arriving in Philadelphia or New York, finds what he has written on the road already published in his newspaper. Truly, we are a nimble people.

Our note concerning the war revenue law, published last week, page 438, should have stated that the clause providing a stamp tax on telegrams exempts service messages of railroad and telegraph companies.

New Railroad Building in the First Half of 1898.

The reports of new road built during the past six months indicate that, in spite of the war, the building for the year will be equal to, if not greater, than that of the last three years. Figures given in detail below by states show that there has been added to the mileage already in operation 1,092 miles during the past six months. Of this mileage all but about 99 miles is directly from official reports received at this office; the rest is compiled from the reports, usually official, which have from time to time appeared in the news columns of the Railroad Gazette. Since a number of the roads are still laying track, it is impossible to give the exact new mileage in these cases at the end of the month, but the estimates are for the most part official and may be considered as fairly accurate. It is not believed, however, that all the new mileage of the United States is included in the above total, but that later and fuller returns will materially increase the aggregate. If the same proportion is held for the coming six months, the mileage of the year will be about 2,185, and this will be larger by some 75 miles than that of last year and will exceed that of any year since 1894. But experience has shown that as a rule more railroad is built in the second half of the year than in the first, so that it is not unreasonable to suppose that the summary for 1898 will show more than 2,200 miles built.

The 1,092 miles here reported was built by 82 companies, or an average of 13½ miles to each company, but the building by few of the companies corresponds closely to this average. The largest mileage during the six months by any one company is that of the Mobile & Ohio, which built 97.6 miles, completing its extension to Montgomery, Ala. Next come the El Paso & Northeastern with 86 miles; the Shreveport & Red River Valley, 45 miles; the completion of the Kansas City & Northern Connection of the Kansas City, Pittsburgh & Gulf, 40 miles; the Astoria & Columbia River, 39.3 miles; the Kansas City, Osceola & Southern, 38.3 miles; the Bruton & Pineora line of the Central of Georgia, 38 miles; and the extension of the San Francisco & San Joaquin Valley, 35.6 miles. The Southern Pacific has built 48.54 miles, but this mile-

age is distributed among five branches, the longest of which is 23.3 miles.

The state which heads the list in new mileage is Alabama, with 125.1 miles; next come Missouri, 94.3 miles; then Louisiana, 78.3 miles; New Mexico, 71.5 miles; North Carolina, 64.65 miles; California, 63.51 miles; Texas, 63.08 miles, and Georgia, 62 miles. At the other end of the list are the following states without a mile of new road reported: Connecticut, Iowa, Kansas, Kentucky, Massachusetts, Nebraska, Nevada, New Hampshire New Jersey, North and South Dakota, Rhode Island, Utah, Vermont, Wyoming and the District of Columbia. It is an interesting point to note that about 620 miles of this increase, or three-fifth of the total, is in the states west of the Mississippi, and that of this, all but about 80 miles is in the southern half of that section. Of the mileage in the Eastern states, about some 378 miles was built in 10 of the states south of the Ohio River. With the exception of five miles in Maine, not a mile was built in the New England states.

A very large proportion of this new mileage has been built for supplying feeders to roads now in operation. This is in accordance with the tendency more and more developed in recent years. A few of the roads, however, are new lines. Such, for instance, is the San Francisco & San Joaquin Valley, which is rapidly building in California as a competitor to the Southern Pacific. The El Paso & Northeastern, which is to run from El Paso, Tex., northeast 165 miles to White Oaks, N. M., will tap a fine coal country and furnish connections with new roads now building in western Mexico. A number of the new roads form connecting links between lines already in existence. Such, for example, is the Kansas City & Northern Connecting, which has been completed from Kansas City to Pattonsburg, Mo., where connection is made with lines east and west for Sioux City and Quincy, Ill. Plans are in progress for a further extension north from Pattonsburg, and in the not distant future, the Kansas City, Pittsburgh & Gulf will, perhaps, tap those grain valleys of which the swin cities of St. Paul and Minneapolis are the center. Another connecting link is that just completed by the Kansas City, Osceola & Southern which, with the old line, will give the St. Louis & San Francisco a direct line to Kansas City.

The returns so far received show a new mileage of 83.5 miles in Canada. This includes 10.5 miles of extensions by the L'Epiphanie & L'Assomption, and the rest by the Canadian Pacific, of which nearly all was on the Crow Nest Pass extension. In Mexico 136.76 miles of new line is reported. Of this the Coahuila & Zacatecas gave 36 miles by completing its line to Concepcion del Oro. The Mexican Central built 27 miles from Jimenes toward Parral; the Mexico, Cuernavaca & Pacific built 46 miles, and the Torres & Priestas, 20 miles. The new mileage for the entire year of 1897 in Mexico was 317.4.

Below are given the figures in detail for the United States, Canada and Mexico, as follows:

NEW MILEAGE BY STATES.

States.	Companies.	Miles.	States.	Companies.	Miles.
Alabama	4	125.1	Montana	1	11.74
Arizona	1	25	New Mexico	2	71.5
Arkansas	5	46.6	New York	3	16.25
California	3	63.51	North Carolina	5	64.25
Colorado	3	21.5	Ohio	2	29
Delaware	1	1.75	Oklahoma Territory	3	61
Florida	4	38.5	Oregon	1	39.3
Georgia	4	62	Pennsylvania	4	6.82
Idaho	1	8.55	South Carolina	2	18
Illinois	2	5.75	Tennessee	1	7
Indiana	2	16	Texas	9	63.08
Indian Territory	1	14.6	Virginia	4	39.5
Louisiana	3	78.3	Washington	1	2.5
Maine	1	5	West Virginia	1	4
Maryland	1	10			
Michigan	1	.5			
Minnesota	1	18.5	United States	82	1,092.30
Mississippi	2	22.5			
Missouri	3	94.3	Canada	2	83.50
			Mexico	6	136.76

Train Accidents in the United States in May.

(*Continued from page 457.*)

and 7 cars fell down 25 ft. It is said that the bridge had been weakened by fire; it is also stated that an iron bridge is being built at this point and that the structure destroyed was a temporary one.

27th, on New England road, near South Windham, Conn., a passenger train was derailed by a broken rail and 2 passenger cars were ditched. One passenger was injured.

And 3 others on 3 roads, involving 3 freight trains.

Defects of Equipment.

10th, on Pennsylvania road, near Mill Hall, Pa., a freight train was derailed by a broken axle and 20 cars were ditched. Two tramps were killed.

27th, on Pennsylvania road, near Lancaster, Pa., a freight train was derailed by a drawbar that was pulled out and fell upon the track, and 5 cars were wrecked. A man stealing a ride was injured.

And 19 others on 17 roads, involving 1 passenger train and 18 freight and other trains.

Negligence in Operating.

13th, 2 a. m., on Pennsylvania road, near Lancaster, Pa., a freight train ran over a misplaced switch and the engine was overturned. The engineman was injured. It is said that the signalman in the tower became confused and threw the switch in the face of the train after he had given a clear signal.

13th, on New York & Long Branch, near Sea Girt, N. J., the rear car of a passenger train was run upon a side track by the premature throwing of a switch and one truck was derailed. Two passengers were injured. It is said that an inexperienced man, temporarily left in charge of the signal tower, threw the switch while the train was passing over it.

25th, on Pittsburgh, Ft. Wayne & Chicago, at Glenfield, Pa., the second section of passenger train No. 2 was derailed at a point where track repairers had taken out a rail for repairs. The fireman was injured. The engine and several express cars were badly damaged.

And 8 others on 8 roads, involving 8 freight trains.

Unforeseen Obstructions.

3d, on Kansas City, Pittsburgh & Gulf, near Baptiste, I. T., a special train carrying officers of the road was derailed at a washout and the engine was overturned. The engineman and fireman were fatally injured.

4th, 10 p. m., on Yazoo & Mississippi Valley, near Rolling Fork, Miss., a freight train was derailed by running over a cow, and the engine and 4 cars were overturned. The engineman and fireman were killed.

27th, on New York, Chicago & St. Louis, near Hobart, Ind., a passenger train was derailed by running over a cow, and the engine was overturned. The engineman and fireman went down with the engine, but were only slightly injured. It is said that the train was running at full speed.

30th, on Louisville & Nashville, near Mt. Vernon, Ill., a freight train was derailed at a switch which had been tampered with and the engine and several cars were wrecked. Two trainmen were injured.

Unexplained.

4th, on Duluth, South Shore & Atlantic, at Ridge, Mich., a passenger train was derailed and all of the cars were overturned, but no passengers were seriously injured.

6th, 2 a. m., on Philadelphia, Wilmington & Baltimore, at Elkton, Md., a car in a freight train was derailed and 3 cars were wrecked. One brakeman was injured.

8th, on Cleveland, Akron & Columbus, near Columbus, O., a passenger train was derailed and the engine was overturned. One passenger was killed and 20 were injured, 3 probably fatally.

8th, on Missouri, Kansas & Texas, near Leliatta, I. T., a work train was derailed and 8 cars of timber were ditched. Three tramps were injured.

10th, on St. Louis, Chicago & St. Paul, near Waverly, Ill., a freight train was derailed and the engineman was injured.

13th, on Northern Central, near Fisher's Ferry, Pa., a freight train was derailed, and a man stealing a ride was killed.

18th, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Trinway, O., a freight train was derailed and 3 trainmen were injured.

19th, 4 a. m., on Terminal Railroad, at Main street, St. Louis, Mo., several cars in a freight train were derailed and the engineman jumped off and was killed.

19th, on Southern Pacific, near Truckee, Cal., a west bound passenger train was derailed and the engine and first 2 cars were ditched. The engineman and 3 tramps riding on the baggage car were injured.

22d, on Southern Pacific, at Oakland, Cal., a passenger train was derailed on a trestle and the locomotive and one car were thrown crosswise of the track. The fireman was killed and the engineman and one brakeman were injured.

31st, 11 p. m., on Illinois Central, near Ashley, Ill., a freight train was derailed and 13 cars were wrecked. Four tramps were injured.

And 23 others on 22 roads, involving 2 passenger and 22 freight and other trains.

OTHER ACCIDENTS.

4th, on Chicago, Rock Island & Pacific, near Green River, Ill., the engine of a special passenger train running at high speed was badly damaged by the breaking of a driving axle, the wheel rolling off into the ditch, and the rod flying up against the cab.

8th, on Baltimore & Ohio, near Watersville, Md., the engine of a freight train standing at the tank taking water was wrecked by the explosion of its boiler, and the engineman and fireman were killed.

14th, on Erie road, near Greycourt, N. Y., the locomotive of a freight train was wrecked by the explosion of its boiler and 10 cars were badly damaged. The engineman and fireman were killed.

17th, on Pennsylvania road, near Conewago, Pa., the baggage car of a train carrying soldiers was destroyed by fire.

31st, on Atlantic City Railroad, near Cedar Brook, N. J., a car in a freight train was wrecked and burned by an explosion of gasoline and a brakeman was injured.

31st, on Hoosac Tunnel & Wilmington, near Wilmington, Vt., the locomotive of a passenger train was wrecked by the explosion of its boiler and the engineman and fireman were killed.

A summary will be found in another column.

Elevated Cars Over the Brooklyn Bridge.

On Saturday morning of last week a trial trip was made by a train of the Brooklyn Elevated Railroad running from the New York terminal of the Brooklyn Bridge to Sheepshead Bay and Manhattan Beach. From 12 to 6 in the afternoon of the same day the regular service was begun and cars ran at intervals of 10 minutes. The number of elevated trains which will cross the bridge from the different routes will be gradually increased until probably about 1,600 a day will come to the New York end. Considerable work must yet be completed before the full number of trains will make the round trip, but the present condition of the work will enable the railroads to begin on a moderate scale, which will probably result in more satisfaction than trying to put on the full number at the start.

Many interesting questions have come up in connection with the running of the surface and elevated trains across the bridge, and at a proper time we hope to be able to go into the matter fully. The improvements in the bridge facilities for the past few years have increased at a relatively greater rate than the increase in the passenger traffic over the bridge, and it is in part due to the adoption of electricity for switching purposes that the present arrangements can be carried out. The indication is that it will be but a question of time when the elevated roads of Brooklyn will find it to their advantage to adopt electricity as the motive power over the entire length of their lines. The necessity of placing motors on the cars, providing them with cable grips, arranging for motive power to run the cars from the present elevated tracks to the terminal and other equally important changes and requirements make the work of considerable importance and very expensive. It takes time to do all this. In previous issues of the Railroad Gazette reference has been made to many of these requirements, so that the readers may be somewhat familiar with the necessary additional equipment. It will be remembered that the trains now running on the Brooklyn Bridge are each made up of one electric motor car and three or more cable grip cars; the motor car being used for switching the train at termini, and the grip car for connecting with the cable on the bridge. In order to prepare the trains of elevated railroads to run over the bridge some have already been equipped in a similar manner, and others are being provided with motor and grip machinery.

On the Kings County Elevated 20 motor cars will be provided, the electrical equipment of which will be done by the Westinghouse Electric and Manufacturing Company. As is evident, the service to which the motor cars will be put may be at times quite severe, and the selection of Westinghouse motors was made on the ground of the good record which they have made under the most exacting conditions of weather, speed and grade.

The trains will be run as follows: When the down town trains going toward the bridge reach Tillary street the steam locomotive will be uncoupled and an electric motor car will haul the train to the foot of the bridge approach, where the cable will be gripped by the trailer cars. At the New York end the necessary switching will be done by the motor car, and the cars hauled back by cable to Brooklyn, where the steam locomotive will again be coupled to the train.

Each car will be provided with four 100 H. P. motors, to be worked in pairs; that is, the motors will run in series-multiple or all motors in multiple. These equipments will operate the heaviest five car train at a maximum speed of about 40 miles per hour on level track.

The trucks are to be furnished by the Baldwin Locomotive Works. The frame is essentially the same as that in use for the four-wheel leading trucks under steam locomotives, a form which has become standard from its good performance under trying conditions. The wrought iron frames are machined throughout and made to template. All attachments, pedestal legs and transoms are lipped over frames and securely bolted thereto through reamed holes, thus making every part interchangeable. The cross pieces at the ends of the frames are so designed as to serve for supports for outside hung brake shoes. The transom forging is of one piece, and takes the place of the numerous parts found in the ordinary car frame structure of side housing forgings, I beam transom and corner stiffening plates. Still another important feature of this design of center is that more space is obtained for the motors and the space underneath the truck frame is left clear for the ready inspection of the motor parts.

The car body is supported on two sets of springs, in accordance with standard methods. The truck bolster is first supported by double elliptical springs carried by swing motion hangers from the transoms; the load is thus transferred to the helical springs and thence to the equalizing bars resting on the journal boxes.

The improved motor suspension above mentioned consists of two new features introduced by the Westinghouse Company. One is that of hanging the motor in a cradle, and the other is the suspension of the cradle directly from the axles of the truck through separate springs, thus entirely removing the motor support from the truck frame proper. In the old form of motor suspension the inside portion of the motor frame was hung to the truck transom, thus bringing the greater portion of the weight of the motor on the spring rigging, and necessitating the use of excessively heavy springs. The effect of such heavy springs was to destroy the ease of riding of the car body; and as the result of reaction of the motor in motion was to slightly tip the truck frame discomfort was furthered by the binding of the journal boxes in their pedestals. The present instance is the first in which cradle suspension has been used for such large motors, and the results will be watched with interest by railroad men generally.

The Kings County Elevated uses on all its cars the Eames vacuum brake. In order that the new apparatus and cars may be used on present trailer cars, the motor cars are to be supplied with the Westinghouse vacuum pumps, which will be driven by Westinghouse direct connected motors.

National Local Freight Agents' Association.

The Eleventh Annual Meeting of the National Association of Local Freight Agents' Associations met at Cincinnati, June 14. One hundred and fifty delegates were present, representing 30 Associations. The members were welcomed to the city by the mayor and addresses were made by W. W. Peabody, Vice-President of the Baltimore & Ohio Southwestern; A. D. McLeod, Assistant General Freight

Agent of the Cincinnati, Hamilton & Dayton, and others.

The condition of the association is good, numerically and financially. The 48 local associations, members of the National, are composed of 501 individual members. New associations added during the year were Atlanta, Ga.; Augusta, Ga.; Boston, Mass.; Chattanooga, Tenn.; Lima, Canton and Massillon, Ohio, and Norfolk, Va.

At the convention last year, Mr. Malcolm Townsend (P. R. R.), of New York, read a paper on the inconveniences attending the shipment of small lots of freight under the immediate-transportation-in-bond act of 1880. That paper was distributed among railroad officials, boards of trade and members of Congress, and the Trunk Line Association, the Western Traffic and other associations took up the subject. With the approval of the Trunk Line Association, the committee proposed a change in the law, and after much work is able to report that its amendment is now with the Ways and Means Committee of the House of Representatives as H. R. Bill 10,459. A favorable reply of the Treasury Department on a reference made by the House Committee has been received, and the bill now awaits action by the House. The bill amends the law of 1880 so as to allow common carriers bonded under the provisions of said law, in instances where a sufficient quantity of bonded merchandise is not offered at the port of first arrival to fill an entire car, or compartment thereof, to forward such merchandise in cars not secured by the prescribed customs fastenings, if the packages are corded and sealed, under regulations to be prescribed by the Secretary of the Treasury; in all other respects the provisions of the act referred to remain in full force.

A Special Committee appointed last year reported a recommendation that a special form of Bill of Lading, shipping order and slip receipt, or dray ticket be used for "Order" shipments with proper spaces for endorsements and identifications by banks. The report was adopted and referred to the Conference Committee, and they were instructed to report this action to the General Freight Agents, requesting them to have the special forms adopted as far as possible.

Next in order came the discussion of the several topics announced in the call for the meeting. The Convention agreed that "How weights are arrived at" should in all cases be shown on billing, but different means of bringing this about were suggested, and it was decided that each Agent should place the matter in the hands of his accounting officer.

Chicago members told how Western Railroads were building exceedingly large cars for light, bulky freight, by which it was designed to secure an advantage over competitors. The results, it appears, are usually different from what was expected; instead of those lines increasing their business, the weaker lines equalize the disadvantage by cutting the rate, or by evasion of some other rule. The practice of building such cars was condemned; the remedy must be applied in the classification by providing a minimum for the several sized cars, using as a basis the cubic foot space in a standard 34-ft. car.

"Use and Abuse of Tracers" brought out a similarity of experience. Probably 90 per cent. of the tracers sent out originate with soliciting agents. They are as expensive as they are useless. By reason of their large number they delay the reply to more worthy ones and really serve only to defeat the real purpose of legitimate tracing. It was unanimously agreed that the Conference Committee ask Traffic Officials to issue such instructions as would restrict tracing to such shipments as were evidently being longer than a reasonable time in transit.

Discussion of the proposition to abolish Sunday work in freight stations revealed the fact that with few exceptions the wisdom of Providence in providing one day in seven as a day of rest is being recognized by the freight agents of this country, and it was shown by actual experiments that better service was obtained by observing the Sabbath day. A demoralizing, weakening effect was observed in those required to work seven days, and all agreed that no work should be done on Sunday but that absolutely necessary to be done.

Lack of uniform methods of handling Government bills of lading was briefly discussed. The burden placed upon carriers of transmitting bills for the consignee's receipt and the intricate system of making collections are onerous. In one department of the Quartermaster General's office it was reported that there were at one time 1,500 unpaid freight bills, simply because the original bill of lading had been lost. It is hoped the remedy may be found by the accounting officers.

New York's members told their experience in lifting bills of lading for "order" shipments that were improperly indorsed by shippers and banks through which they had passed, and were improperly identified. This was found to be an evil which existed at all points. The Conference Committee will endeavor to remedy it by getting the co-operation of the National Banking Association.

The use of typewriter machines for making way bills was discussed. The limited experience of the members made it impossible for the Association as a whole to approve or condemn them, but it was agreed that the experience of a few of the members would warrant further trials.

Wheeling members advocated that all soliciting agents of whatever title receive instructions and report only through the local agent in whose territory they may work. The argument is that the local agent, knowing best the facilities and abilities of his company, and being in closest touch with the business as a whole, no one should intervene between him and the managing officials. No action was taken, but the discussion will be brought to the notice of the traffic departments.

The following officers were elected for the ensuing year:

President, Malcolm Townsend (P. R. R.), New York; Vice-President, L. Page (C. B. & Q.), Peoria, Ill.; Secretary, F. J. Banholtz (N. Y. C. & H. R.), New York: Treasurer, C. H. Newton (Wabash), Fort Wayne, Ind.

The next meeting will be held at Norfolk, Va. The business sessions were interspersed with visits to places of interest, important industries, and railroad terminals and a trip to the Soliders' Home at Dayton. The meeting was regarded as the most successful ever held.

Railroad Telegraph Superintendent's Annual Meeting.

The seventeenth annual convention of the Association of Railway Telegraph Superintendents was held at Omaha, Neb., June 15, Vice-President Ryder in the chair. Hon. Frank E. Moore, Mayor of Omaha, welcomed the delegates and presented the Association with the keys of the city.

The report of Secretary P. W. Drew showed the Association to be in a prosperous condition. The reports of various standing committees were read, and the Secretary was instructed to accept a limited amount of advertising to help defray the expenses of the publication of the annual report.

The election of officers was next taken up. W. W. Ryder (C., B. & Q.) was elected President, L. B. Foley (D., L. & W.) Vice-President, and P. W. Drew (Wis. Cent.), Milwaukee, Secretary.

A paper on "Unnecessary Telegraphing," by Mr. C. S. Rhoads of Indianapolis, was then read and discussed. Mr. Rhoads said, in part:

Fortunate, indeed, will be the man who can convince the average official or employee, having free access to the railroad wire, that he is using it unnecessarily, and do so without giving offense. But the average railroad man, nine times out of ten, either sends a message that is in reality a letter or he makes his necessary message much longer than it need be, crowding out more important telegrams and delaying business. . . Why use the word "please" in a telegram? Railroad messages are supposed to be business telegrams, and the word "please" has no place in them. And in the use of "pink" telegrams we find occasion to call a halt. These are intended only for rush business, but even here the force of habit is so great that the operator often feels like doing a little cutting out on his own hook. In the month of April my attention was called to a telegram from the passenger department to the transportation department relative to furnishing cars for an excursion next October. Corrections on freight billing go out by wire to points hundreds of miles distant, even before the freight has started out of the yard.

Many railroad people are not educated up to the proper use of the telephone. It is still a common practice to give information or instructions by telephone, and then follow it up with a long message by telegraph beginning, "Confirming my 'phone of this date."

A circular issued by our General Superintendent, approved by the General Manager, made a great improvement on our road. Specific cases taken up personally with the heads of departments may be made a restraining influence.

Railroad telephone service was the subject of the next paper. It was by E. A. Chenery, of St. Louis. He described the plant in operation on the Terminal Railroad of St. Louis. Sixty-four stations, embracing all the St. Louis offices, are connected telephonically. The various connections are made automatically. The advantages of such a complete system are great. Business of importance, formerly conducted through correspondence, messenger service and by telegraph wires, is now satisfactorily handled by telephone and with tenfold better dispatch.

Mr. Kenneth McKenzie of Jackson, Tenn., read a paper on telegraph construction and maintenance. Mr. McKenzie recommends that where telegraph lines are subject to severe sleet storms, two-pole lines be built. The poles should be set six feet apart at the bottom, brought together at the top and bolted firmly together with a bolt ½ in. in diameter. The cross-arms should be fastened to both poles with ½-in. bolts. One bolt in each cross-arm would be sufficient. This would obviate the use of arm-braces. The poles should be further strengthened by sway braces where necessary. On sharp curves the outside pole should be anchored. When two poles are used, they need not to be as heavy as in a single line. For instance, when a pole 7 in. in diameter at the top is used, poles of 5½ in. would be heavy enough when doubled.

A paper on the block system was read by Mr. H. C. Hope (C., St. P., M. & O.), of St. Paul, Minn. The speaker described the single-track practice of his road. He said in part:

Where permissive blocking is practised, trains should be admitted to the block under the authority of a caution card colored red. It should be one blank, but in two parts or divisions, the first part containing information as to other trains in the block, the second part to take the place of a release card, thus obviating the necessity of issuing two cards.

The caution card should be issued: (1) To permit a train to follow another train in the same block; (2) when trains are to meet at a non-telegraph station; (3) where trains are to meet and the passing track is in advance of the block signal.

The release card should be green in color, to correspond with a clear signal. It is only issued when there is no train in the block ahead.

The release card is to be used (1) when the signal is displayed at "stop" for some other train, and there is no train in the block ahead; (2) in case the signal is displayed at "stop" to block a train until all trains in both directions in the block ahead have cleared the block; (3) to release a train from the signal after train orders have been delivered to such train, if there is no train in the block ahead; (4) if the signal is improperly displayed or is not changed in time to avoid stopping the train, and there is no train in the block ahead and there are no orders on hand.

There is a decided objection to allowing trains to meet at an intermediate side track between two block signal stations, but if such is permitted it should be done by special order, and in such case provision should be made to guard against failure of either signalman to deliver the order. This is accomplished by forbidding the train dispatcher to authorize a caution cards for any of the trains addressed until "complete" has been given to all trains addressed. A signalman having orders on hand should leave his block signal at "stop" for all trains moving in the same direction until the orders are delivered to the proper train. The rear brakeman should be required to see that the signal is replaced at the stop position immediately after the passage of his train. No train should be allowed to follow a train nor to meet or pass a train in the same block except by caution card in addition to a special order. A crossover permit should be approved by the train dispatcher before being used.

To guard against letting a train into a block occupied by another train without a caution card, signalmen must refuse to give the signalman's response, blocking opposing trains, when there is a train in the block, until advised by the signalman who requests the response that he will give a caution card to the train which is to enter the block.

All signalmen, enginemen and trainmen working within the limits of the telegraph block system should be required to pass examination on the rules governing the system before being assigned to duty.

The Committee on Low Resistance, U. J. Fry chairman, made a report showing that nearly all of the railroad telegraph superintendents are in favor of the change from high to low resistance relays. Only one Superintendent is opposed to the innovation. Since the subject was first brought to the attention of the Association, four years ago, 110 circuits have been equipped with low resistance relays on 15 different railroads, embracing a total of 3,500 telegraph instruments. Most of these circuits are equipped with 150-ohm relays, connected in multiple. Three or four railroads have circuits equipped with 25, 35 and 60-ohm series-wound relays. The report then goes on to say that it is found that multiple relays which are burned by lightning are affected only in the first or second winding from the core. Superintendent Greene of the Northern Pacific furnished the committee with a plan which he thinks will reduce the liability to burn out these instruments by lightning. His advice is to wind one of the coils in the opposite direction from which they are ordinarily wound, then connect the two outside wires for one side and the two inside wires for the other side, thus removing the short path for the current from one binding post to the other.

This paper was discussed at some length and the committee was ordered to render a supplementary report of any new developments at the 1899 meeting.

The next meeting will be held at Wilmington, N. C., July 19, 1899.

Among the many outside entertainments was a reception given by Mr. and Mrs. J. J. Dickey at their residence.

EXHIBITS.

Mr. W. S. Logue represented the Edison Phonoplex and had a circuit in operation at the Exposition, where it was inspected by the delegates. Mr. Logue has just installed phonoplex circuits between Omaha and Grand Island, Neb., and between Cincinnati, O., and Lexington, Ky., for the Western Union. He is about to place a circuit between Indianapolis and Union, Ind., which will make about 14 phonoplex lines recently installed by Mr. Logue on Western Union lines.

The Railroad Supply Co., Chicago (E. W. Vogel), showed a signal for highway crossings. This signal has a 10-candle power incandescent lamp which is illuminated at the approach of a train; the train also operates a bell.

Mr. Henry M. Sperry of the National Switch and Signal Co. of Easton, Pa., explained the electric train staff.

The Parrish Crossing Signal Co. of Jackson, Mich., showed a model of its electric signal for highway crossings. Mr. E. D. Warner, Treasurer of the company, was present.

The Maryland Telephone Manufacturing Co. of Baltimore, Md., showed a telephone device for district and private line telephone circuits. No secondaries are employed. By talking with one battery the transmitter plays practically the same part as does the ordinary key in the telegraph service.

John A. Roebling's Sons Co., Trenton, N. J., was represented by W. S. Eckert. Mr. Eckert distributed samples of bi-metallic wire, and expatiated upon its peculiar electrical and superior mechanical qualities.

Train Dispatchers' Convention.

The eleventh annual convention of the Train Dispatchers' Association of America was held at Montreal June 15 and 16. At the opening there were present 43 members and five non-members from various lines. The address of the President, H. B. Ware, congratulated the convention on the improved financial circumstances of the association, the increased membership and interest taken in its work during

the past year and the almost certain lifting of its debt. The President suggested the holding of semi-annual meetings, and urged that the present policy of the association be steadfastly followed. The report of the Executive Committee showed an increase of 75 members during the year, with a loss of 59 members lapsed, 3 withdrawn and 8 deceased, making the present membership 437; receipts, $1,090, including $362 contributed to the fund for the liquidation of the debt.

The afternoon of Thursday was devoted to excursions to Vaudreuil and Beloeil, on invitation of the Grand Trunk. Stops were made at the Victoria Bridge, whose tubular spans are now being replaced by steel truss spans.

The convention reassembled at 8 p. m. and discussed the Train Rules Committee's report, which, after being vigorously discussed section by section, was unanimously approved, except that the recommendations regarding the fourth paragraph to the explanations of Form C, and of Form H, were objected to by a small minority. The Train Rules Committee's report consisted of recommendations for a number of slight changes in the standard code of rules for the movement of trains by telegraphic orders. The proposed changes, which seem to be the result of very careful comparison of the views of a number of the most expert dispatchers, have been laid before the Committee of the American Railway Association.

At this session Mr. Thomas Tait, Manager of the Canadian Pacific and a member of the Train Rules Committee of the American Railway Association, made a short address.

The convention referred the subjects of "Electric train order signals controlled by the dispatcher," "Electric call bells under control of the dispatcher" and of "Absolute meeting points between trains of the same class," upon which there was insufficient information, to the consideration of the Train Rules Committee during the coming year. A paper on "The Profession and Status of the Train Dispatcher," by H. E. Lamb (C., St. P., M. & O.), was read and ordered printed.

The special committee recommended that the subscription price of the official organ be raised to 50 cents a year, and its form and size left to the discretion of the editor; that the debt to the Railway Age be, if possible, raised before adjournment, and that the salary of the Secretary (who is also treasurer and editor) be raised to $1,000. The committee disapproved of semi-annual conventions. The report was accepted and indorsed by the convention. The full amount of the Railway Age debt was reported to have been contributed by members of the convention, and there was a short jubilee over the announcement. The next annual meeting will be at Milwaukee, June 20, 1899.

The old officers were re-elected as follows: President, H. B. Ware (B. & M. R.), Wymore, Neb.; Secretary, J. F. Mackie (C., R. I. & P.), Chicago.

The President appointed as the Train Rules Committee for the ensuing year Messrs. F. Patterson (A., T. & S. F.), Topeka; H. E. Lamb (C., St. P. & M. & O.), St. Paul; H. A. Dalby (N. Y., N. H. & H.), New Haven; J. M. McIlhany (N. & W.), Roanoke, and F. M. Benning (C., R. I. & P.), Blue Island, Ill.

On Friday a trip was made to Quebec on invitation of the Canadian Pacific. Superintendents Robillard and Hall accompanied the party over their respective divisions, and the train made high speed. The fastest mile was made in 48 seconds. One run of 22 miles from stop to stop was made in 22 minutes. The members of the convention were greatly pleased with the reception afforded them.

Exhibits at the Saratoga Convention.

The following is a list of the exhibits not in place at the time of going to press last week:

Acme Pipe Clamp Co., St. Louis, Mo.—Acme pipe clamp for air brake pipes.

D. Altman, Chattanooga, Tenn.—Models of an automatic car coupler.

Ashton Valve Co., Boston, Mass.—The exhibit of this company was in the Grand Union Hotel, and consisted of samples of Ashton safety and open pop safety valves, Ashton double spring locomotive steam gages and duplex air gages.

Boston Belting Co., Boston, Mass.—A full line of rubber goods for railroad equipment, including steam and air brake hose and mechanical rubber goods. These were displayed in the Grand Union Hotel.

The Bradley Co., Syracuse, N. Y.—Models of Bradley hammers and samples of forgings made by Bradley hammers.

The John Davis Co., Chicago, Ill.—Four Eclipse locomotive and marine reducing valves.

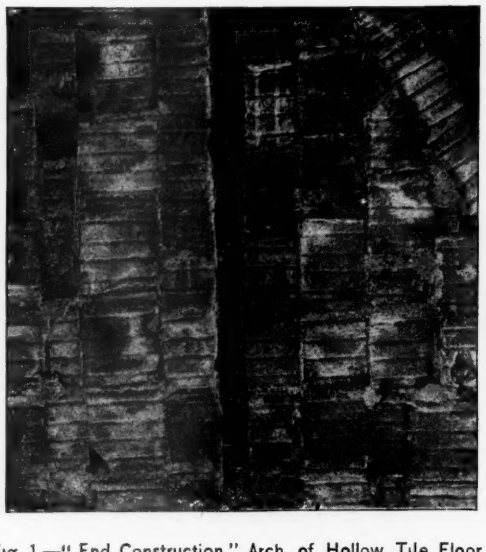

Fig 1.—"End Construction" Arch of Hollow Tile Floor Arches.

Edgar-Sebring Car Seal Lock Co., Colorado Springs, Colo.—Sample of the Edgar-Sebring car seal lock applied to a section of a freight car door.

J. A. Ellis, Detroit, Mich.—Detroit M. C. B. coupler and Thornburgh attachments, equipped with Landem springs and box followers.

Fox Pressed Steel Equipment Co., Havemeyer Bldg., New York City.—Models, in aluminum, of the Fox freight and tender truck and body bolster.

The Hale & Kilburn Mfg. Co., Philadelphia, Pa.—Two full-size Walkover car seats, with oval pedestal base, automatic shifting foot rail and other recent improvements.

M. C. Hammett, Troy, N. Y.—Samples of Hammett oil cups.

Hancock Inspirator Co., Boston, Mass.—The company exhibited the new Hancock Composite injector, having a minimum capacity of 250 gals. and a maximum capacity of 2,015 gals. an hour, and the Hancock railroad water tank, in addition to the specialties mentioned last week.

Homestead Valve Mfg. Co., Homestead, Pa.—Samples of the Homestead straightway valve and locomotive blow-off.

Jenkins Bros., New York City.—Samples of Jenkins valves and packings.

Mason Regulator Co., Boston, Mass.—Steam pumps and damper regulators, air brake regulators, reducing valves and speed governors.

McGuire Mfg. Co., Chicago, Ill.—Model of the McGuire rabbetted grain door.

Moran Flexible Steam Joint Co., Louisville, Ky.—The exhibit of this company was very unique. It consisted of a representation of the battleship Kentucky made by an arrangement of Moran flexible joints and car heating connections and their parts, together with other all metal specialties made by the company.

Pettingell & Laub, Denison, Ia.—Four full size Laub couplers.

Rand Drill Co., 100 Broadway, New York City.—A 30-H.P. Rand air compressor, which furnished air for operating the pneumatic tools in the exhibit of the Chicago Pneumatic Tool Co.

Reed Mfg. Co., Erie, Pa.—Samples of Reed pipe wrenches.

Rochester Automatic Lubricator Co., Rochester, N. Y.—Samples of automatic lubricators for locomotives.

Safety Car Heating & Lighting Co., 160 Broadway, New York City.—A model of the company's system of heating cars was shown in the office of Congress Hall, in addition to the lighting and gas cooking devices referred to last week.

Smith Adjustable Car Axle Bearing Co., 120 Broadway, New York City.—Samples of the Smith adjustable journal bearing for cars, including full-size models of those in use on several roads, which showed their adaptability, both to the M. C. B. and any special boxes. One bearing exhibited had run 20,413 miles with a loss of but four ounces of metal.

Thos. Tighe, Schenectady, N. Y.—Model of a car door fastener.

Universal Car Bearing Co., 11 Broadway, New York City.—Samples of the Universal car bearing.

E. C. Washburn, Minneapolis, Minn.—Full-size Washburn M. C. B. coupler.

Western Railway Equipment Co., Chicago, Ill.—In addition to the specialties mentioned last week, the company exhibited models of the Missouri car door and C. & M. angle cocks.

Hollow Tile Floor Arches.

During 1896 and 1897 the Department of Buildings of New York city made numerous tests of materials used in floor arch construction to determine their resistance to fire on a large scale. It will be remembered that while the concrete arches always stood the most severe tests, several arches of hollow tile failed after the fires under them had burned from 1 hr. 35 min. to 3 hrs. The hollow tile makers claimed that the arches subjected to test were not as good as customarily built in structures, in spite of much evidence to the contrary.

In order to lay before our readers samples of tile arches, we present three illustrations of this material, built in steel framing. Although the arches can be properly put in regular framing, this is not possible when the plan of structure provides any floor spaces which are not rectangular.

These photographs, taken in the Ivins Syndicate Building on Park Row, New York, show average hollow tile floor-arch construction, as passed by the New York Department of Buildings, without the slightest criticism or objection, and are not selected as abnormal or accidental cases. In the "end-construction" arches, irregular framing, an engraving of which is shown in Fig. 1, the ribs are supposed to be opposite each other, in order to transmit stresses from girder to girder, and the keystones should be in the center to produce symmetrical construction.

The joints are supposed to be well cemented, "chinked" or spalled with slate when necessary, and should of course protect the iron work. It will be noted that the material lacks uniformity, that it is very much cracked and checked during manufacture, and frequently chipped; there are hard and soft burned blocks in the same ring, and blocks of various sizes are used indiscriminately. Moreover, the joints are quite irregular, showing that the ribs are not opposite each other, and are carelessly cemented.

The keystones are of various, irregular dimensions and were evidently used at random.

In the irregular framing (Fig. 2) all the defects previously mentioned will be found, besides a great many others. The blocks are apparently thrown in, regardless of fitness, size, material or any other rules, and they seem to be put in place merely to fill a hole; blocks are used crosswise, instead of endwise, and triangular holes are filled by spalls and chips thrown in with more or less cement. That such construction can have any strength, except accidentally, is self-evident.

Such strikingly defective work can be found in all of our larger buildings, wherever the angles of the steel skeleton framing are otherwise than square, and no excuse can be offered for such work. That a fire test of such construction would cause very rapid destruction is self evident.

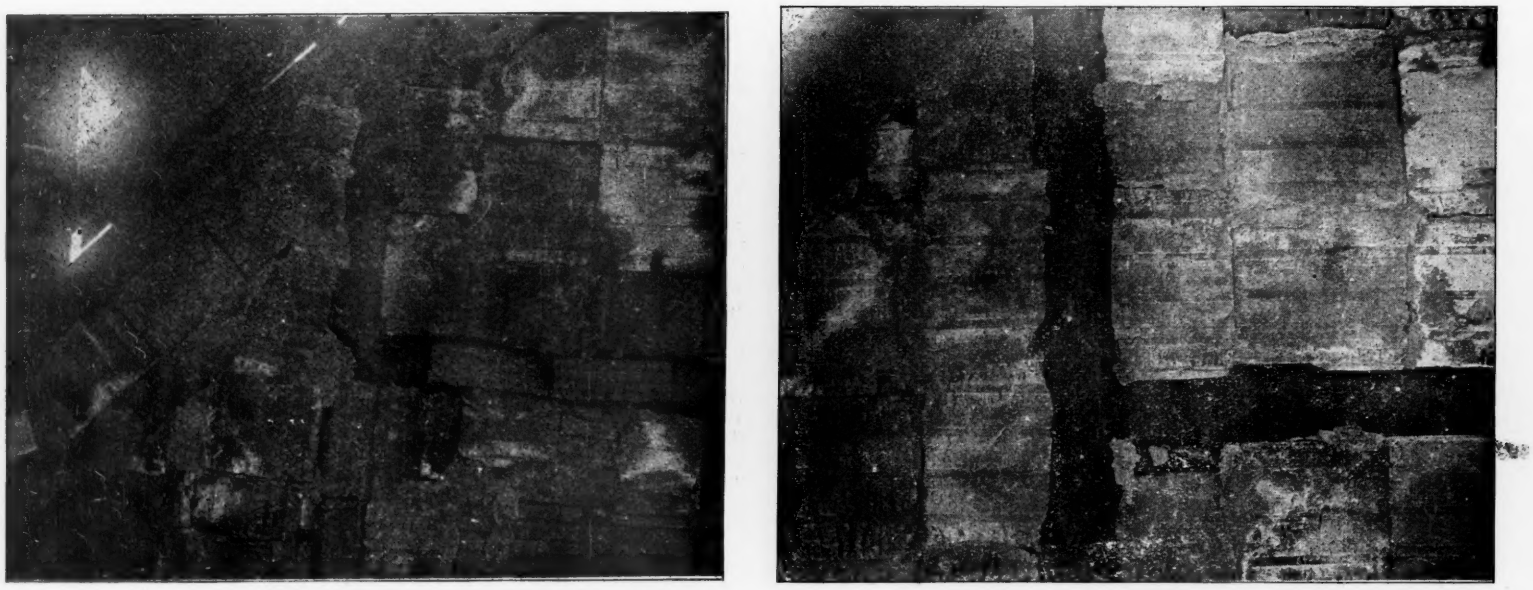

Fig. 2.—Views Showing Irregular Framing of Arches in Fireproof Floors of the Ivins Syndicate Building, New York.

TECHNICAL.

Manufacturing and Business.

The Wheeler Car Seat Company, 43 Cedar Street, New York, has acquired all the patents covering the Wheeler car seat, together with all the patents formerly owned by the Bushnell Manufacturing Company of Easton, Pa., including car seats, springs, etc., and is now prepared to furnish any and all devices covered by these patents. The officers are: Oakleigh Thorne, President; Charles Hansel, Vice-President and General Manager; George H. Hansel, Secretary and Treasurer. James Hitchcock, with office at 1237 Monadnock Building, Chicago, is Sales Agent.

The Lidgerwood Mfg. Co., New York, is preparing a pamphlet describing the Lidgerwood Safety Derrick engine. They state that their ordinary standard double drum hoisting engine will operate a derrick safely, one drum hoisting the load and the other the boom, but to obtain the maximum capacity of the derrick the changes of motion are so rapid that accidents frequently occur; hence the demand for a safe and rapid derrick engine which, it is claimed, is fully met in the Lidgerwood Safety Derrick Engine, patented Feb. 9, 1897.

The annual meeting of the stockholders of the Siemens & Halske Electric Company of America was held at Chicago June 16, and the following were elected Directors: Chas. T. Yerkes, Martin Maloney, John R. Bartlett, R. Suydam Grant, Chas. E. Yerkes, E. A. Moore, B. W. Grist, Howland Coit, W. L. Elkins, Jr. Following are the officers of the Company: Chas. E. Yerkes, President; W. T. Block, Secretary and Treasurer; C. F. Marlow, Assistant Secretary and Assistant Treasurer; B. W. Grist, General Manager.

The United Gas & Improvement Company of Philadelphia, Pa., is making extensive additions to its gas producing plant. At the 25th Ward Gas Works a new scrubber house, 45 ft. wide and 120 ft. long; a purifier house, 86 ft. wide and 180 ft. long, are being built. At the Point Breeze works a boiler and engine room 220 ft. long and 55 ft. wide; a condenser building, 40 ft. wide and 105 ft. long; a purifier building 86 ft. wide and 180 ft. long; a generator house 100 ft. wide and 184 ft. long; a meter house with additions for exhaust and valve room, 70 ft. wide and 223 ft. long, are being built. All of these buildings are of steel frame construction, brick side walls and slate roofs, supported on metal purlins carried by clear span trusses. All the structural steel work for this plant is being furnished and put up by the Berlin Iron Bridge Company of East Berlin, Conn.

The Court of Common Pleas of Northampton County, Pa., has appointed Charles Hansel Receiver and General Manager of the Bushnell Manufacturing Company of Easton, Pa. All correspondence relative to the business of that Company should be directed to the Receiver at 43 Cedar Street, New York City.

The Chicago & Eastern Bridge Co. of Winthrop, Mo., has been incorporated by W. F. Guthrie, H. H. Todd and G. F. Chaves, with a capital of $20,000.

The Brown & Sharpe Mfg. Co., Providence, R. I., has been licensed to do business in Illinois, with a capital stock of $2,000.

The Illinois Rolling Stock Co., East St. Louis, Ill., has certified to an increase in the capital stock from $300,000 to $1,000,000.

The Brooks Locomotive Works have contracted with the Morgan Engineering Co. of Alliance, O., for two electric overhead traveling cranes, to be used in the new shop now building.

The F. C. Austin Mfg. Co., Harvey, Ill., is in the market for one 8 or 10 ft. boring mill with two heads.

Articles have been filed incorporating the Dearing Water Tube Boiler Co. of Detroit, Mich., to manufacture and sell water tube boilers under the A. C. Dearing patents. The incorporators are: Jacob Siegel, Anson C. Dearing, Arthur McBean, Joseph Siegel and Chas. W. Moses. The capital stock is $25,800.

Prentice Bros., Worcester, Mass., will build a new shop 350x50 ft. three stories high.

Thomas Carlin's Sons, Allegheny, Pa., will send three mixers to Japan.

Laidlaw-Dunn-Gordon Co., Cincinnati, O., have shipped three duplex pumps to Rangoon, India, and seven duplex steam pumps to Yokohama, Japan.

The plant of the Carlisle Mfg. Co., Carlisle, Pa., with its rights, franchises, good will and fixtures, has been sold at public sale. The property known as the upper shops was sold to John W. Plank for $15,600. The car works and frog shop property was sold to George Rice for $70,750. The accounts receivable, bonds, etc., were bought by John Hays for $32.

A permit has been issued to the Jarecki Mfg. Co., Erie, Pa., to build an addition to their plant.

It is stated that the Chihuahua & Pacific Railroad will soon be in the market for several 50-ton turntables and for other permanent way material. The local offices of the road are at 80 Broadway, New York.

Geo. E. Pratt, 1103 Betz Building, Philadelphia, Pa., has been appointed Agent for the Ajax Metal Co. of Philadelphia, Forsyth Bros. & Co. of Chicago, and the Jackson & Sharpe Co. of Wilmington, Del.

Iron and Steel.

The Paxton Rolling Mill, which is part of the plant of the Central Iron & Steel Co., was burned to the ground June 19, entailing a loss of nearly $40,000. The insurance is about $20,000.

Shipment of the rails for the Trans-Siberian Railroad was begun June 17, from the Sparrows Point Works of the Maryland Steel Co.

The Watts Steel & Iron Syndicate, Ltd., of Middlesborough, Ky., (C. P. Perin, General Manager), has had one blast furnace in operation for several months. A second one is now nearly ready to blow in and will be running as soon as the setting of two Cahall boilers is completed. Mr. Perin informs us that he will begin making open hearth steel by July 15.

The Alabama Steel & Ship Building Co. has been organized in Birmingham, Ala., by local and New York capitalists, with a capital stock of $490,000, with N. E. Barker as President. The Tennessee Coal & Iron Co. is promoter of the enterprise and guarantees its bonds to the amount of $1,100,000. Reports state that the new company has let a contract to the Wellman-Seaver Engineering Co. of Cleveland, O., for the building of a $1,000,000 steel plant at Ensley City, Ala.

The Petersburg Iron Works, Petersburg, Va., have been awarded a contract by the Government for 10,000 4-in. shells and 1,200 7-in. shells.

Garrett B. Stevens, William Kerper, John S. Kennedy, Philip H. Brice and Edgar Brusewitz have made application for a charter for a company to be called the Sheridan Iron Works Co. It is stated that this company will operate the furnaces known as Sheridan No. 1 and Sheridan No. 2.

The Riter-Conley Co., Pittsburgh, has shipped 10 car loads of structural steel to Dublin, Ireland. Another shipment will soon be made and mechanics will be sent with it to build a power house for the Dublin Electric Tramway Co.

Bids will be received until noon, Aug. 2, for the supply of 1,000 tons of 50-lb. rails and fastenings, to be delivered in April, 1899, c. i. f., on the Prince Edward Island Railway wharf at Summerside, P. E. I.; 5,000 tons of 80-lb. rails and fastenings, to be delivered in April, 1899, on the Intercolonial Railway wharf at St. John, N. B. Specifications and conditions, forms of tender, etc., will be furnished by L. K. Jones, Secretary, Department of Railways and Canals, Ottawa, Canada.

John Jarrett, Secretary of the Association of Iron & Steel Manufacturers, has announced that the sheet steel manufacturers are trying to arrange for a general shut down for six weeks, beginning July 1.

The American Steel Casting Co. will build an extension to its plant at Chester, Pa.

New Stations and Shops.

Van Brunt & Howe are working on plans for remodeling the Union depot at Kansas City, Mo., which work is to cost about $40,000.

The plans of Frost & Granger, Chicago architects, for enlarging and improving the new Union depot at St. Paul, have been approved, and work on the building will be commenced shortly. The Milwaukee Bridge Co. has been awarded the contract for altering the train shed, and P. H. Donovan & Son, of Minneapolis, have received the contract for the main improvement of the station house. The building is to be extended 40 ft., and in the interior rearrangement there will be three waiting rooms, the main one 70 ft. x 70 ft., with marble floor and birchwood finishing. The ladies' waiting room will be 72 ft. x 44 ft., and the smoking room 40 ft. x 44 ft. Two baggage rooms will be added to the north side of the main building.

The terminal bill has been signed by the Mayor of Nashville, Tenn., and work will be commenced soon on a new Union depot for that city. The main building will be five stories high, 167 ft. x 167 ft. The train shed will extend southward from the rear of the main building, will be built of steel, and will be 240 ft. wide and 500 ft. long, and will have a clear arch span of 200 ft., covering eleven tracks. The tower on the station proper will be 25 ft. x 25 ft. and 219 ft. high. The building will be 190 ft. high to the cornice line. The plans also call for three freight sheds 50 ft. x 100 ft. each two stories high. It is estimated that the entire work will cost about $1,650,000. Work must begin within thirty days, and the passenger station and viaducts must be finished by Jan. 1, 1901.

It is stated that the contracts for the building of the new roundhouse of the Atchison, Topeka & Santa Fe, at Winfield, Kan., have been let, and that work will begin at once.

The Missouri Pacific will build a new station at Topeka, Kan., on the site of the present station, which will be torn down.

The work on the new depot for the New York Central at Albany will probably commence soon. The Common Council has agreed to the purchase of a site, the city to pay one-half the purchase price of $100,000 and the railroad company the other half.

The Elgin, Joliet & Eastern is having plans drawn for a new transfer house 100 ft. x 400 ft., to be built on the company's dock at 102d St. and Calumet River, South Chicago, for the transfer of freight to and from boats and cars. The dock for 1,200 ft. has been placed ready for use. It is said that this improvement will cost about $10,000.

It is stated that the Lake Shore & Michigan Southern will add 700 ft. of steel sheds to its passenger station at Toledo.

The Cleveland, Cincinnati, Chicago & St. Louis will build a new freight depot at Dayton, O. Contracts have not yet been let.

The Steam Motor on the C., H. & D.

On June 1 the Cincinnati, Hamilton & Dayton made its first actual schedule with its new steam motor car against the Traction Company. The schedule is slightly quicker than that made by the electric, the run being between Middletown and Hamilton, a distance of fourteen and a half miles. The C., H. & D. has adopted Traction Company's rates. The results so far are much better than expected, and the company is quite confident that with the motor car making frequent stops and giving frequent service at the Traction Company's rates and with steam trains at the regular rates, and fast time, it has the situation pretty well in hand and can make any attempts to compete for long distances by electric lines a very unprofitable investment.

Officers of the M. C. B. Association.

The following were elected officers of the Master Car Builders' Association, to serve during the ensuing year:

President, Mr. C. A. Schroyer.
First Vice-President, Mr. John T. Chamberlin.
Second Vice-President, Mr. J. J. Hennessey.
Third Vice-President, Mr. W. J. Robertson.
Executive Committee, Messrs. E. D. Bronner, J. H. McConnell and William Apps.
Treasurer, Mr. G. W. Demarest.

Transmission Plant of the Apple River Power Co.

At Somerset, on the Apple River, Wisconsin, an electrical plant has recently been started for transmitting electrical energy seven miles to New Richmond, where are mills which have been using steam. The company has a contract for doing the city lighting, and pumping for the city water supply, besides several contracts for power for mills and elevators. The water wheels installed are horizontal, designed to run at 130 revolutions per minute and to develop 231 H.P. on an 18-ft. head, with an efficiency of 80 per cent. The turbines are twin 42-in. machines, by which the end-thrust is neutralized, mounted on a horizontal 6-in. shaft, and discharging into a double quarter-turn cast-iron central draft-chest fitted with a draft-tube 7 ft. in diameter and 8 ft. long, running into a wheel-pit 12 ft. deep. The electrical apparatus consists of one 250 K.W., 6,000 volt. three-phase alternator of the inductor type; two 2½ H.P. 125 volt exciters; one 100, one 50 and one 30 H.P. two-phase brushless-type motors; one 25 H.P. brush-type motor; five 50 K.W. and two 25 K.W. 5,500 volt three-phase to 220 volt two-phase, self-ventilating oil-transformers; and six sets of 6,000 volt Wurts combination choke-oil non-arcing metal lightning-arresters. The transmission potential over the line is about 5,500 volts, which is reduced to 220 volts for use.

Polyphase Motors in Electric Traction.

Mr. C. P. Steinmetz some time since discussed this question in which he called attention to the three methods available to control polyphase motors: (1) Rheostatic control; (2) tandem multiple control, and (3) potential regulation with short circuited armatures. The advantages and disadvantages of rheostatic control are the same as on the direct current system. This also applies to tandem multiple control. Potential regulation is the simplest method, the impressed E. M. F. being varied by means of a transformer of variable transformation. Unfortunately, in this case the motor efficiency is lower than that with rheostatic control, and the torque per ampere is very low at starting, and the motor is liable to fail at the start, unless the drop in the line is very small. Thus this method is usually not adapted for railroad work.

Cost of Motive Power in Kansas City.

As the result of an investigation of the operating expenses on the 136.5 miles of single track run by the Metropolitan Street Railway Company, of Kansas City, it has been found that the average cost of one kilowatt hour is 4.874 cents. The current which furnishes the power is used on about seventy-seven cars, which run on the seventy-one miles of electric lines, the remainder of the cars in Kansas City being worked by cable. One of the cable lines, four and a half miles long, is run by a 300 K.W. electric motor in a substation supplied from the principal generating station one and seven-tenths miles distant. The total cost of working this plant and the steam plant formerly used show a saving of $660 a month, which amounts to about 64 per cent. About 5,000 cast welded joints are used on old rails with excellent results, but in the new construction 103 lb. rails were put down and are cast welded and also bonded with copper bonds.

Electric Traction in Switzerland.

A few months ago the Street Railway Journal gave some interesting information regarding the present condition of the tramways in Switzerland. From the figures given the indication is that in two years the

length of track for electric roads will be double that at present. Of the motive power now used at the central stations the Swiss tramways are subdivided as follows: 14.2 per cent are run by steam, 64.5 by water power and 21.3 by gas engines. The total capital invested at the end of 1896 in electric lines averaged in round numbers $25,000 per mile of track. It is interesting to note also in the table giving the different kinds of trolley used on the more important roads that nine out of the nineteen given use the sliding shoe; the others, with one exception, use the wheel. The lines actually in construction at the present time number twelve, with a length of 103 kilometers (64½ miles). There are twenty-five lines which have been granted franchises, but have not yet been built. These have a length of 322.7 kilometers (201¾ miles). The continuous current was used up to 1895. Since that time the tri-phase alternating current has come into practical use, and the first installation of this kind is at Lugano. Several lines of considerable length are making investigations in the question of voltage, and after a consultation with the Government Railroad Department a new law was adopted last year by which the voltage could be increased. The adoption of this law was preceded by a number of tests carried out by Prof. H. F. Weber, and his conclusions which have in substance now become part of the law should result in considerable saving in the building and running of electric railroads in Switzerland.

Three New Battleships.

The Navy Department is advertising for bids for building three new battleships. The circulars defining the chief characteristics of the vessels are now ready for distribution among bidders. Bids will be received until 12 o'clock noon, Thursday, Sept. 1, 1898. Forms of proposal and contract may be had, and the plans and specifications examined, upon application to the Department on and after July 25.

Compressed Air Motor Cars in New York.

In our issues of May 15 and 20 last reference was made to the plans for running the Hoadley-Knight compressed air cars. On page 363 we gave the route that will be followed by the cars running between the Twenty-third and Thirty-fourth street ferries. The complete equipment for 20 cars will be sufficient to provide for a service between the Grand Central and Pennsylvania roads via Twenty-third street ferry. The route will be as follows: Up Thirteenth avenue to Twenty-eighth street, crossing over to Fourth avenue, up Fourth avenue to New York & New Haven Depot, west over Forty-second street to Vanderbilt avenue, up Vanderbilt avenue to New York Central Depot, across Forty-fourth street to Madison avenue, down Madison avenue to Forty-second street, and so return to Twenty-ninth street, running east over Twenty-ninth street and south to Twenty-third street ferry. Thus the large passenger traffic between these points will be handled with the same convenience as carriages, without any transfer or exposure to inclement weather.

THE SCRAP HEAP.

Notes.

About 100 men were dismissed from the shops of the Chicago & Alton at Bloomington on June 18.

The State Auditor of Kansas has completed the tabulation of the railroad tax valuations for the year 1898. The total is $60,305,466, an increase over last year of $925,272.

The city of Augusta, Ga., has passed an ordinance providing increased penalties for scalping tickets without a license. For every offense the ordinance prescribes a fine of $200 or imprisonment not over 90 days.

Salter D. Worden, who was convicted of murder for wrecking a train during the strike in California in 1894, has finally been declared of unsound mind, and Governor Budd has commuted his death sentence to imprisonment for life.

The Atchison, Topeka & Santa Fe is now running passenger engines through between Marceline, Mo., and Topeka, Kan., 288 miles. The men change at Kansas City as heretofore. By establishing these long runs the trains can be handled with three engines less than under the old plan.

The long pending negotiations for the building of a new union passenger station at Albany, N. Y., have been advanced a step by the action of the Common Council of the city, on Monday last, in agreeing to bear one-half the cost of the land for the station. It is said that the site will cost $100,000.

The Supreme Court of Mississippi has decided a long pending suit against the Yazoo & Mississippi Valley Railroad, involving taxes aggregating about $750,000. The railroad claimed 30 years' exemption under an old charter, but the court rejects this claim and holds that the taxes must be paid.

The Boston Herald, after many weeks of laborious agitation, has succeeded in getting the vice president of the New York, New Haven & Hartford to say that, personally, he thinks that "New York & Boston" would be an appropriate name for the road if the present name were to be given up. To make a change, however, it would be necessary to secure the consent of the Legislature of Connecticut, and the local pride of the legislators would probably make them reluctant to give up the two Connecticut names in the present title, notwithstanding the fact that they represent only way stations.

The New East River Bridge Commissioners.

The quo warrento proceedings which were instituted against the present municipal administration by the former East River Bridge Commissioners (Messrs. Waters, Deeves, Thurber, Baird, Sperry and Batterman), to test the title to office of the present Commissioners appointed by Mayor Van Wyck, Jan. 19, were decided in favor of the relators by Justice Garretson in the Supreme Court in Brooklyn June 15. The Justice said in part:

"I find that the removal of the relators was not within the purview of the charter of the City of New York, which gave the Mayor authority to remove appointees within six months after his induction into office. The gentlemen who originally constituted the commission still remain, as a matter of law, the Commissioners. There being no power of removal, as a matter of law, they were not removed. I direct the jury to find a verdict in favor of the relators on the ground that they are still the Commissioners, and that the respondents are not."

Assistant Corporation Counsel Jenks asked for a stay of execution of the judgment pending an appeal to the Appellate Division. It was granted, and the counsel will endeavor to have the case argued at the present term. Should this decision of Justice Garretson be confirmed by the Appellate Division and possibly by the Court of Appeals, it will not only affect the Bridge Commission, but the Aqueduct Commission and the Shore Road Commission as well.

The Chicago Lake Front.

The Supreme Court of Illinois sustains the lower court in refusing the injunction which the Illinois Central Railroad had applied for to restrain the city of Chicago from interfering with the company in its plans for filling in certain land in the shallow waters of Lake Michigan, between Twenty-fifth and Twenty-seventh streets, for the purpose of building an engine house thereon. The railroad company claimed possession under its charter, and held that it had the right as riparian owner to fill in the lake and build upon new-made land. The Court holds that the lands under the water of Lake Michigan belong to the state of Illinois, but that the state has no power to barter or sell them. They are held in trust for the people, for the purposes of navigation and fishery.

To Promote Asiatic Trade.

Permanent form has been given to the Committee on American interests in China, which was organized early in the present year. It will be known as the American-Asiatic Association. At a meeting held at 59 Wall street, New York, the following officers were elected: President, Everett Frazar, of Frazar & Co.; Vice-President, Samuel D. Brewster, of Deering, Milliken & Co.; Treasurer, J. R. Patterson, of Fearon, Daniel & Co.; Secretary, John Foord. Executive Committee, Clarence Cary, of Cary & Whitridge; Thomas A. Phelan, of Geo. W. Lane Co.; Wm. H. Stevens, of the American Trading Co.; Albert Tilt, President of the Phoenix Silk Mfg. Co.; Silas D. Webb, President of the China and Japan Trading Co., and E. L. Zalinski, of the Bethlehem Iron Co.

In the constitution the objects and purposes of the association are thus defined: "First, to foster and safeguard the trade and commercial interests of the citizens of the United States and others associated therewith, in the Empires of China, Japan and Corea, the Philippine Islands, and elsewhere in Asia or Oceanica; second, to secure the advantages of sustained watchfulness and ready action which will accrue from united and permanent organization, whether in scrutiny or action in regard to trade and treaty rights, or new legislation or treaties affecting the same; third, to provide for convenient ascertainment and distribution of information affecting the interests of its members; fourth, and, generally, to promote a beneficial acquaintance and association of those having interests and pursuits in common concerned wth such trade or commerce."

Chicago Street Railroad Franchises.

At a meeting of the Civic Federation of Chicago, held June 9, to discuss the relations of the street railroads to the municipality Mr. Charles T. Yerkes, by invitation, presented the companies' side of the argument for franchise extensions. Mr. Yerkes argued in favor of the so-called Allen law, which was enacted by the Illinois Legislature in June, 1897. This law gives city councils power to grant franchises and extensions to street railway companies not exceeding fifty years, the fare for twenty years to be 5 cents, after twenty years the fare to be fixed by the Council, which is also to fix the rate of compensation to be paid to the cities. Mr. Yerkes also said that any committee fairly and impartially constituted could obtain from the street railway companies any information needed to enlighten the public concerning their business. Mr. N. A. Partridge opened and closed the discussion for the Civic Federation, opposing the Allen law. The meeting was attended by many prominent citizens. Since this meeting the Civic Federation, in response to Mr. Yerkes' suggestion, has appointed a committee of twelve to investigate the subject fully and report on franchise extensions and the compensation question. This is the third investigating committee which has been appointed. The first, appointed by Mayor Harrison, failed to accomplish anything on account of the refusal of the street railway companies to furnish information, and its report has never been published. The second committee, composed of prominent citizens, this spring failed to agree upon a proper mode of procedure and adjourned without taking any action.

The Largest Lake Load.

The steamer "Superior City" last week at Escanaba took on 7,568 short tons of iron ore, said to be the largest load ever carried by a lake steamer. With this cargo the vessel drew 18 ft. of water. Ore is now being carried from the northern iron regions to Lake Erie ports for about one-half mill per ton per mile.

Fast Run on the Wabash.

The new fast passenger train of the Wabash road makes records faster than a weekly journal can keep track of them. The run of 177 miles in 182 minutes, reported in our last issue, was beaten by the same train over the same course on Thursday, June 16. The time from Tilton to Granite City, 176.6 miles, was 2 hours, 49 minutes and 30 seconds, equal to 62.5 miles an hour. Deducting the stops, the time was 163 minutes, equal to 65 miles an hour. From Litchfield to Granite City, 44 miles, the rate of speed was 67.68 miles an hour.

A New Road to Marl Beds in Michigan.

The Peerless Portland Cement Co., of Union City, Mich., is building a road about three miles long, to connect the Michigan Central at Union City with marl beds. Grading was begun May 11. The N. P. Glenn Construction Co., of Toledo, O., has the contract. The grades and curves are easy. There will be three bridges each of 200 ft. From 40 to 50 men are at work and grading is finished for two miles. J. E. Saxon of Union City is President of the Cement Co. (Railroad Construction Column, May 20, p. 367.)

Chicago Contracts.

The Board of Trustees of the Chicago Sanitary District on June 17 awarded the contract for the by-pass, mentioned in our last issue, along the front of the Pennsylvania Company's property. Contract for the substructure was let to the Lydon & Drews Co. for $87,212, and for the superstructure to Griffiths & McDermott for $88,692. Another by-pass is to be built under some tracks of the Chicago & Alton, adjoining the Pennsylvania tracks, between Adams and Van Buren streets, the Boar dand the railroad company having reached an agreement similar to that with the Pennsylvania. The Chicago & Alton by-pass will cost about $20,000.

Electric Fans in Sleeping Cars.

The Baltimore & Ohio Southwestern is the first road, so far as we have learned, to do its passengers the very simple, but very important, favor of cooling sleeping cars in stations at night. At Cincinnati, Louisville and St. Louis sleeping cars are placed in the stations at 10 p. m., not to depart until after midnight, and in order to make them comfortable and cool 16-in. rotary electric fans are placed in each end of each car, thus removing the heated and impure air from all parts of the car. The fans have been in operation about two weeks, and have been the subject of many favorable comments from passengers.

Chicago Public Works.

Commissioner McGann awarded a contract June 7 to the Pittsburgh Meter Co. for 1,200 water meters for the city for this year, to cost $70,000.

In the litigation between the city of Chicago and Joseph J. Duffy, contractor for work on the Northwest land tunnel, the appellate court on June 7 dismissed the appeal of the city from the circuit court judgment for $204,000 in favor of the contractor. The appellate court holds that the case involves construction of the constitution and should have gone to the supreme court, to which the case will now be taken. Meantime work on the tunnel is suspended.

Manchester Ship Canal.

Several important undertakings are either approaching completion or in progress, in connection with the general equipment of the Manchester Ship Canal and in other directions, which will contribute toward increased carrying trade, and also toward the development of industrial enterprise and activity in the district.

Among the most important of these is a large grain elevator and silo, now nearly completed, which has been erected for the Ship Canal Warehousing Co. by Messrs. John S. Metcalf & Co., Chicago, on American lines, and capable of storing 40,000 tons of grain. Adjoining this elevator a large malting-house is now in course of erection, into which the grain will be delivered direct from the elevator, and this, it is anticipated, will result in establishing a considerable malting business in the neighborhood.

A new shed warehouse, with four floors, each having a storage capacity of 7,000 tons, is in course of construction. This shed is fireproof throughout, with Goulden's patent floors, built with curved channels, with expanded metal inserted in the concrete, and it may be mentioned that this is the first time these floors have been applied to any really large work, the patent floors which are being put down in the new shed covering an area of 25,600 sq. yds.

Ample provision is being made for developing an import oil trade on the Manchester Ship Canal, large storage tanks having been erected at Mode Wheel by the Manchester Corporation, the Liverpool Storage Company, and Messrs. Bagnall, whilst at Eccles the Anglo-Caucasian Oil Company are erecting large oil tanks. At the whole of these tanks the oil is pumped direct from the tank steamers that come up the Canal.

The latest extension of the Canal is the flotation of the "Manchester Liners Limited," which will establish special lines of steamers for the Manchester Docks. The Company have purchased a couple of steamers, so that the business might be commenced at once, and, in the meantime, larger steamers, of about 9,000 tons capacity, are being built. The first of the purchased steamers, the Parkmore, with a dead-weight tonnage of about 5,000, is now on its journey from Montreal, with a large cargo of general goods, and between three and four hundred cattle for the Manchester Docks. She will be followed by the Queensmore, and two other boats which have been chartered to maintain a regular service in the meantime.—The Mechanical Engineer.

New York Air Brake Company Election.

The annual meeting of the New York Air Brake Company was held in New York City June 16. Officers elected for the year are: President, Charles A. Starbuck; Vice-President, Daniel Magone; Second Vice-President, George B. Massey; Secretary and Treasurer, John C. Thompson. The following Directors were elected: Daniel Magone, Henry A. Rogers, Crawford Livingston, Jay C. Young, Thomas C. Purdy, George B. Massey, Clifford H. Chaffee, Charles A. Starbuck and John C. Thompson.

The Arbitration Law.

The Railroad Gazette calls attention to two features of the Federal Arbitration law that did not appear in the summary of it given at the time of its passage. One is section 9 and the other section 10, neither of which has anything to do with arbitration. The first forbids receivers to reduce wages except on the order of the court after a hearing, and the second forbids a railroad to require a member of a relief department to renounce his legal claim against the company

on account of any accident if he accepts relief from the fund for such accident. It seems to us that these two restrictions are another serious step toward the deprivation of corporations of the rights that belong to them. Why a receiver should not have the same right to reduce the wages of the employees of a bankrupt concern that he has to make any other change in the management in order to put the property on a paying basis passes comprehension. Equally incomprehensible is it to deny a railroad the right to contract with its employees that in case of injury and the receipt of aid from the relief department, to which it makes generous contributions voluntarily in the same way that they do, it shall not be subject to a suit for damages. Such a provision is likely to incline railroads to abandon the policy of establishing relief departments, a policy that has been commended by philanthropists.—Rochester Post-Express.

LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works are building one mogul engine for the Louisiana & Arkansas.

The Baltimore & Ohio Southwestern is having one locomotive built by the Baldwin Locomotive Works.

The Chicago, Milwaukee & St. Paul has placed an order with the Baldwin Locomotive Works for five switching locomotives.

The Stearns Mfg. Co. of Erie, Pa., is building one 25-ton locomotive for the American River Land & Lumber Co. of San Francisco, Cal. The engine will be shipped in a few days.

The Baldwin Locomotive Works have received an order from the Southern Railway for four consolidation engines in addition to the twelve we mentioned April 29.

The Baltimore & Ohio has placed an order with the Baldwin Locomotive Works for 15 consolidation locomotives with 21 in. x 26 in. cylinders and five consolidation locomotives with 22 in. x 28 in. cylinders.

The Wabash has received the first of the locomotives ordered from Richmond Locomotive Works. We gave a description of these locomotives in our issue of Jan. 14. The order was for 10 compound and five simple.

CAR BUILDING.

Pullman's Palace Car Co. is building 10 sleeping cars at its shops.

The Pennsylvania Railroad is building at its shops 16 passenger cars.

The Philadelphia & Reading will build 600 coal cars at its Reading, Pa., shops.

The Barney & Smith Car Co. is building 100 freight cars for the Southern Indiana.

Pullman's Palace Car Co. is building 1,000 more box cars for the Chesapeake & Ohio.

The South Baltimore Car Works are building 200 freight cars for the Baltimore & Ohio.

The Baldwin Locomotive Works are building six locomotives for the Denver & Rio Grande.

The Illinois Car & Equipment Co. is building 25 freight cars for the Western Car & Equipment Co.

The Alabama & Vicksburg is having one 8-wheel locomotive built by the Baldwin Locomotive Works.

Pullman's Palace Car Co. is building five passenger cars for the San Francisco & San Joaquin Valley Ry.

The New York Central & Hudson River is having 1,000 freight cars built by the Michigan Peninsular Car Co.

The Delaware & Hudson Canal Co. has ordered 250 hopper bottom coal cars from the Buffalo Car & Mfg. Co.

It is reported that the Milton Car Works have received an order from the Pennsylvania Railroad to build 400 box cars.

In our issue of April 29 we noted that the Minneapolis, St. Paul & Sault Ste. Marie was asking bids on 500 box cars. The order has been placed with the Wells & French Co.

The Lima Locomotive & Machine Co., Lima, O., is building 12 logging cars for the American River Land & Lumber Co., San Francisco, Cal. The cars are being built according to specifications of the makers, and are known as the Lima Locomotive & Machine Co. standard No. 1 diamond truck logging car. They will be 22 ft. long over all, 7 ft. 6 in. wide, 11 ft. 4½ in. center to center of body bolsters. The trucks will be 36 in. gage, rigid; the wheel base will be 46 in.; the wheels will be cast iron, 24 in. in diameter, and the journals 3 x 6½.

BRIDGE BUILDING.

BRAMPTON, ONT.—A new bridge will be built across the river at this place. Address J. H. Watson, Snellgrove.

BUFFALO, N. Y.—The bill to authorize the bridge over the Niagara River at Grand Island passed the House of Representatives. (April 8, p. 264.)

CARTHAGE, MISS.—Press reports state that bids are wanted July 5 for building a new bridge over Lobutcha River.

CHILLICOTHE, O.—The Commissioners of Ross County will build a new bridge 500 ft. long.

CRYSTAL LAKE, N. J.—The Board of Freeholders of Bergen County have ordered the Melan Arch Construction Co., 35 Nassau street, New York, to make plans and specifications for a Melan arch bridge, 26 ft. span, 24 ft. wide, and bids will be called for when plans are ready. Thos. Post, Ch. Com., Midland Park, N. J.

KITTANNING, PA.—A new bridge must be built over the Cowanshannock Creek at Gosford. S. B. Gray, Surveyor; Benj. Oswald, Clerk, Armstrong County.

MAHWA, N. J.—At a meeting, June 17, the Board of Freeholders voted in favor of a Melan arch bridge, 32 ft. span, 22 ft. wide, and ordered the Melan Arch Construction Co., 35 Nassau street, New York, to make plans, etc. When plans are ready bids will be called for. A. A. King, Ch. Com., Mahwa, N. J.

MUSKEGON, MICH.—Mayor Balbirnie and City Attorney C. W. Sessions were in conference recently with General Manager J. H. P. Hughart and W. B. Stimson, Superintendent of the northern division of the Grand Rapids & Indiana, on matters relative to the building of a new viaduct at Bidler St. in Muskegon. The Muskegon people say the present structure is old and should be replaced by a new one. The matter was taken under advisement by the Grand Rapids & Indiana officials and an investigation will be made.

NEW BRUNSWICK, N. J.—In extending its track to Dunellen and Somerville the Brunswick Traction Co. will be required to widen and strengthen several small bridges and culverts.

ORILLIA, ONT.—The Grand Trunk will build a new bridge at the Narrows, near this town.

READING, PA.—Ira P. Rothermel presented to the court a report of the viewers recommending an iron bridge over Plum Creek in Perry. A. F. Mogel, Clerk; Solomon K. Dreibeubis, Surveyor, Berks Co.

ST. PAUL, MINN.—Mr. E. H. McHenry, Chief Engineer, is reported as saying that the Northern Pacific is building 15 new steel bridges and that 10 miles of old structures are being replaced by embankments and permanent steel structures.

SAGINAW, MICH.—Local press reports say that a new bridge will probably be built at Genesee avenue.

SEATTLE, WASH.—The Grant Street Electric Ry. Co. will built a new bridge on the line of the Georgetown loop extension.

UNION CITY, MICH.—The Peerless Cement Co., of Union City, will build three bridges, each of 200 ft.

VANCOUVER, WASH.—The bill to authorize the British Columbia, Seattle & Pacific Coast RR. to build a bridge over the Columbia River at Vancouver was read twice in the Senate and referred to the Committee on Commerce June 30. (May 20, p. 365.)

WALDICK, N. J.—The Melan Arch Construction Co., 35 Nassau street, New York, have prepared plans and specifications for a Melan bridge 16 ft. span, 32 ft. wide, at this place, and bids for its construction will shortly be asked for. T. V. Terhune, Ch. Com., Ridgewood, N. J.

WASHINGTON, D. C.—Mr. Dockery on June 20, called up the conference report on the District of Columbia Appropriation bill, and the roll was called for a vote upon concurring in the Senate amendment authorizing the construction of a bridge over Rock Creek on Massachusetts avenue. The motion was agreed to—100 to 54.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Chicago & Western Ind.—Quarterly, 1½ per cent., payable July 1.

Cleveland, Cin., Chi. & St. L.—Preferred, quarterly, 1¼ per cent., payable July 20.

Denver & Rio Grande.—Preferred, 1½ per cent., payable July 15.

Fitchburg.—Two per cent., payable July 15.

Petersburg.—Common and preferred, 3½ per cent., payable July 1.

Richmond & Petersburg.—Three and one-half per cent., payable July 1.

Pacific Coast Co.—First preferred, 5 per cent., 2d preferred 1 per cent., payable July 20.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

American Society of Civil Engineers.—Meets at the house of the society, 220 West Fifty-seventh street, New York, on the first and third Wednesdays in each month at 8 p. m.

American Society of Railroad Superintendents.—Annual meeting, Crossman House, Alexandria Bay (Thousand Islands), N. Y., July 13 and 14.

Association of Engineers of Virginia.—Holds its formal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building, Roanoke, at 5 p. m.

Boston Society of Civil Engineers.—Meets at 715 Tremont Temple, Boston, on the third Wednesday in each month at 7.30 p. m.

Canadian Society of Civil Engineers.—Meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday at 8 p. m.

Central Railway Club.—Meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

Chicago Electrical Association.—Meets at Room 7,137, Monadnock Building, Chicago, on the first and third Fridays of each month at 8 p. m. J. R. Cravath, secretary.

Civil Engineers' Club of Cleveland.—Meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

Civil Engineers' Society of St. Paul.—Meets on the first Monday of each month except June, July, August and September.

Denver Society of Civil Engineers.—Meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

Engineers' Club of Cincinnati.—Meets at the rooms of the Literary Club, 25 East Eighth street, on the third Thursday of each month, excepting July and August, at 7.30 p. m.

Engineers' Club of Columbus (O.).—Meets at 12½ North High street on the first and third Saturdays from September to June.

Engineers' Club of Minneapolis.—Meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

Engineers' Club of Philadelphia.—Meets at the house of the club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month at 8 p. m., except during July and August.

Engineers' Club of St. Louis.—Meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

Engineers' Society of Western New York.—Holds regular meetings on the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

Engineers' Society of Western Pennsylvania.—Meets at 410 Penn avenue, Pittsburg, Pa., on the third Tuesday in each month at 7.30 p. m.

Locomotive Foreman's Club.—Meets every second Tuesday in the clubroom of the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn street, Chicago.

Montana Society of Civil Engineers.—Meets at Helena, Mont., on the third Saturday in each month at 7.30 p. m.

National Railroad Master Blacksmith Association.—Sixth annual convention, Boston, Sept. 6.

New England Railroad Club.—Meets at Pierce Hall, Copley Square, Boston, Mass., on the second Tuesday of each month.

New York Railroad Club.—Meets at 12 West Thirty-first street, New York City, on the third Thursday in each month at 8 p. m.

Northwest Railway Club.—Meets on the first Tuesday after the second Monday in each month at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

Northwestern Track and Bridge Association.—Meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

St. Louis Railway Club.—Holds its regular meeting on the second Friday of each month at 3 p. m.

Southern and Southwestern Railway Club.—Meets at the Kimball House, Atlanta, Ga., on the second Thursday in January, April, August and November.

Technical Society of the Pacific Coast.—Meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month at 8 p. m.

Western Foundrymen's Association.—Meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

Western Railway Club.—Meets in Chicago on the Third Tuesday of each month at 2 p. m.

Western Society of Engineers.—Meets in its rooms on the first Wednesday of each month at 8 p. m., to hear reports and for the reading and discussion of papers. The headquarters of the society are at 1736-1739 Monadnock Block, Chicago.

Canadian Electrical Association.

The annual meeting of the Canadian Electrical Association will be held at the Windsor Hotel, Dominion Square, Montreal, Que., June 28, 29 and 30. Papers will be presented at the meeting Tuesday afternoon and Wednesday morning. On Thursday morning the annual election of officers will take place. On Tuesday evening, on Wednesday morning and evening and Thursday morning and afternoon there will be excursions and other social features in connection with the meeting. Probably one of the most pleasant features will be the visit to McGill University, where a very excellent course in electricity is carried out. The preparations have been most extensive in order to make the time spent at Montreal of especial interest. The following papers will be presented:

"How to Overcome Some of the Difficulties Encountered by Central Station Men."—A. A. Wright.

"The Unconscious Ownership of an Important Key" (a plea for the introduction of goods traffic on our suburban tramways).—W. T. Bonner.

"The Quimby Screw Pump."—W. T. Bonner.

"Experiences of an Inspector."—Dr. J. K. Johnstone, Inspector of Electric Light, Toronto.

"The Electric Current in the Rainy River Gold Mines."—W. W. Hopkins.

"The Importance of Proper Methods of Illumination."—F. A. Bowman.

"Electric Utilization of Water Powers."—Louis DeWitt Magie.

"Economies in the Boiler Room."—James Milne.

International Society for Testing Materials.

A meeting of this Society was held on Thursday evening last at the Engineers' Club, Philadelphia, for the purpose of organizing the "American Section." Twenty members were present, and after a thorough discussion, preliminary steps were taken for completing the organization. The following Executive Committee was appointed: Chairman, Prof. Mansfield Merriman; Vice-Chairman, Prof. H. M. Howe; Treasurer, Mr. P. Kreuzpointner, of Altoona; Secretary, Mr. R. L. Humphrey, Philadelphia. Two confidential counselors were appointed in the persons of Prof. H. M. Howe and Dr. R. G. G. Moldenke. Mr. Gus C. Henning was made an ex-officio member of the Executive Committee. Mr. Henning represents officially the Society in this country with authority to collect dues and otherwise officially represent the Society here. The International Society was organized a few years ago and has taken up many questions relating to the testing of materials, particularly in the unification of standard methods. The necessity for carrying out the work has caused the Society to outline certain disputed points that should be settled bearing on the testing of different metals, artificial and natural stone and cements. At the meeting last Thursday committees were appointed to represent this country in recommending standards. These committees are made up from representatives of different countries and number in most cases about twenty-four members. The annual dues are $1.50 and the subscription to the official organ, Baumaterialienkunde, published by Stahl & Friedel, of Stuttgart, Germany, is $2.50. It has been proposed to establish the Sidero Chemical Laboratory in Germany, in which will be carried out such tests as seem most important to the interests of the Society. As proposed at present, practically all the work will be done voluntarily by the members.

PERSONAL.

—Among the recent appointments by the President are: Engineer officers with the rank of Major-Captain, J. A. Irons, of the 20th Infantry, and First-Lieutenant, S. Cosby, Corps of Engineers.

—Mr. Geroge E. Bent, at one time Auditor of the Philadelphia, Wilmington & Baltimore line of the Pennsylvania, died at his home in Chester, Pa., June 19, in his eighty-seventh year. He had been an invalid for a number of years.

—Mr. C. F. Howell, Chief Engineer, has been detached from the Newark, and ordered to the Norfolk Hospital, and Mr. C. R. Roelker, Chief Engineer, has been detached from the Board of Inspection and Sur-

vey, and ordered on board the Newark, succeeding Mr. Howell.

—Mr. J. C. Whitridge, Associate Editor of the Railroad Gazette, has received the degree of Mechanical Engineeer from Purdue University. This is a post graduate degree conferred for actual work. Mr. Whitridge's thesis, written as a candidate for this degree, was on Brake Shoes for Cars.

—Mr. Frank G. Darlington, Superintendent of the Indianapolis Division of the Pennsylvania Co., has resigned owing to ill health. Mr. Darlington entered railroad service in 1878, and has been connected with the Little Miami, Cincinnati & Muskingum Valley, and the Pittsburgh, Cincinnati & St. Louis, until he was appointed Superintendent of the Indianapolis Division in March, 1890.

—Mr. George A. Cullen, Chief Clerk of the Western Passenger Association, has been appointed Chairman of the Western Immigrant Clearing House, with headquarters at New York, succeeding Mr. Charles M. Pratt, resigned, to become Chairman of the Southwestern Passenger Association. He will enter upon his new duties as soon as he returns from a vacation on the Pacific coast.

—Mr. Arthur Keen, who is widely connected with the iron, steel and kindred trades in the United Kingdom, is visiting the United States. Besides being Vice-President of the Institute of Mechanical Engineers, Vice-President of the Iron & Steel Institute, and a member of the Board of Management of the British Iron Trade Association, he is a Director in the firm of Bolckow, Vaughan & Co., Limited, of Middlesbrough-on-Tees, one of the largest producers of pig-iron and steel in the United Kingdom, employing about 16,000 persons.

— Mr. Everett Marean, Master of Transportation of the George's Creek & Cumberland, with office at Cumberland, Md., died Saturday evening, June 11, at the house of his daughter, at Brookland, a suburb of Washington. Mr. Marean was born in Lackawanna County, Pa., fifty-eight years ago. He was with the Delaware, Lackawanna & Western Railroad for a while. He went to Baltimore in 1873, and was General Agent for the Baltimore & Ohio for five years, leaving that company to become Master of Transportation of the George's Creek & Cumberland, holding the position until his death.

—Colonel Henry Flad died very suddenly in Pittsburgh, Pa., on the afternoon of June 20. Colonel Flad was 74 years old, and in his long and useful life had attained a place of great honor and distinction in his profession as a civil engineer. He became a member of the American Society of Civil Engineers in 1871, and was its President in 1886 and 1887. His most conspicuous work was as engineer of the Eads Bridge at St. Louis, under Capt. Eads, but he has done a great deal of useful and honorable work besides that. We hope to say something more adequate concerning his career in our next issue.

—Mr. J. F. Stevens, chief engineer of the Great Northern, has resigned on account of ill health. Mr. Stevens has been in railroad service since 1876, becoming chief engineer of the Great Northern in 1895. The resignation takes effect July 1. During his twenty-eight years of railroad service, Mr. Stevens has been connected with the Denver & Rio Grande, the St. Paul, the Canadian Pacific, the Duluth, South Shore & Atlantic, the Spokane Falls & Northern, and perhaps other northwestern roads. He has made a solid reputation as a competent and substantial man, and he has all the modesty and sensitiveness as to professional obligation characteristic of the engineer.

—Ex-Governor Francis M. Drake, who has just resigned the presidency of the Indiana, Illinois & Iowa, was born Dec. 30, 1830, at Rushville, Ill. He entered railroad service in 1866, and until 1870 was President of the Iowa Southern, which by consolidation became the Missouri, Iowa & Nebraska, now the Keokuk & Western. He built the Centerville, Moravia & Alvia, now the Alvia & Centerville; also two roads in Iowa now branches of the Central Iowa from Marshalltown, Ia., to Stony City, and from Hampton to Belmont. In 1881-2 he built the Indiana, Illinois & Iowa, from the presidency of which he has just resigned. In 1896-7 he was Governor of the State of Iowa.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—Hon. J. D. M. Hamilton, a lawyer of Fort Madison, Ia., has been appointed Claims Attorney of the entire system, with headquarters at Topeka, Kan.

Central of New Jersey.—G. O. Waterman, heretofore Auditor of Receipts and Disbursements, has been appointed Assistant Controller. His former office is abolished. (June 17, p. 444.)

Chicago & Northwestern.—Traveling Freight Agent W. A. Cox has been promoted General Agent at Cincinnati, O., succeding A. Q. Tallant, transferred to Pittsburgh, Pa.

Chicago Great Western.—T. H. Quill has been appointed Traveling Passenger Agent, with headquarters at Cincinnati, O., succeeding J. G. Mooney, resigned. His territory will include the States of Ohio, Kentucky, Tennessee and Georgia.

Chicago, Peoria & St. Louis.—C. R. Manter has been appointed General Agent, with headquarters in Chicago, Ill.

Detroit, Toledo & Milwaukee.—Harry Hall of Toledo, O., has been appointed Auditor. Mr. Hall began railroad service as bookkeeper for the Wheeling & Lake Erie, and later was with the Cincinnati, Jackson & Mackinaw. He has recently been Traveling Auditor of the D., T. & M.

El Paso & Northeastern.—C. F. Winn, formerly Joint Foreman of the Denver & Rio Grande and the Rio Grande Western, at Durango, Cal., has been appointed Master Mechanic of the E. P. & N. E. with office at El Paso, Tex., succeeding George F. Miller.

Fitchburg.—A. S. Crane, heretofore General Freight Agent, Boston, has been appointed General Traffic Manager, the office having been recently created by the Board of Directors at a special meeting. Mr. Crane's first railroad service was with the Great Western Dispatch and the South Shore Line at Chicago, Ill., as Contracting Agent. That was for three years from November, 1877. He went to Boston in 1880 as New England Agent of the South Shore Line, and in April, 1883, was made General Freight and Passenger Agent of the Boston, Hoosac Tunnel & Western, now Fitchburg. His next position dated from September, 1884, as General Freight Agent of the Chicago & Atlantic, now Chicago & Erie, which he held until 1890, when he returned to the Fitchburg to become General Freight Agent, succeeding C. L. Hartwell in that position.

Florida Central & Peninsular.—M. V. Raley, Trainmaster, with headquarters at Savannah, Ga., has been appointed Superintendent of Transportation, and will be located at Waldo, Fla.

Gulf, Texas & Northern.—The following are the Directors and officers elected for this new company, which was mentioned in the Railroad Construction column last week (p. 445): S. W. Sholans and George Bancroft of Orange, Tex.; L. W. Lloyd and J. Lake of Marshall, Tex.; John B. Mesney, D. C. Plum and C. W. Higgins of Chicago, Ill. L. W. Lloyd of Marshall becomes Vice-President; W. W. Reid of Orange, Tex., will be Treasurer.

Illinois Central.—Isaac Anderson, Auditor of Disbursements, has resigned on account of poor health. He is succeeded by C. F. Krebs, formerly Auditor of the Chesapeake, Ohio & Southwestern Division of the I. C., with headquarters at Louisville, Ky.

Indiana, Illinois & Iowa.—At a meeting of the Directors, held in Chicago, Ill., June 16, Gov. F. M. Drake, President, resigned on account of poor health. The Directors elected T. P. Shonts, his son-in-law and General Manager of the road, to succeed him. Jay Morton, of Chicago, Ill., has been elected Vice-President, succeeding George H Holt, of New York, resigned.

Interoceanic of Mexico.—L. H. Sherman, Master Mechanic, with headquarters at Puebla, Mex., has resigned.

Kansas City, Pittsburgh & Gulf.—The following appointments are announced, effective at once: Oscar H. Poehler, heretofore Commercial Agent at Shreveport, La., to be General Freight and Passenger Agent at Fort Smith, Ark.; H. N. Hall, Commercial Agent, Freight and Passenger Department, Fort Smith. E. E. Elmore succeeds Mr. Poehler at Shreveport. J. A. Hapley has been appointed to the newly created office of Freight Traffic Manager, appointment taking effect June 25.

Mexican Industrial.— The officers of this company referred to in the Construction column are: President, S. W. Reynolds, 7 Exchange Place, Boston, Mass., and Ortega 28, City of Mexico, Mex.; Vice-President, W. S. Wait, Boston; General Manager, Edward H. Whorf, Mexico; Chief Engineer, J. E. Earley, Mexico. (May 13, p. 348.)

Minneapolis & St. Louis.—W. F. Fox, Superintendent of Telegraph at Minneapolis, Minn., has resigned, and T. E. Clark has been assigned to the office in addition to his present duties as General Superintendent.

Missouri, Kansas & Texas.—Aubrey G. Maguire, Traveling Freight Agent, with office at Houston, Tex., has been promoted to Commercial Agent at New Orleans, La., succeeding J. H. Craig, who has been appointed General Agent of the line at Galveston, Tex.

New York, Susquehanna & Western.—New officers have been elected for this company, recently absorbed by the Erie, as follows: President, E. B. Thomas; First Vice-President, G. M. Cumming; Second Vice-President, W. F. Merrill; Third Vice-President, F. P. Moore; Secretary, J. A. Middleton; Treasurer, Edward White; Auditor, J. T. Wann. The new officers assume their duties on July 1.

Oregon Short Line.—J. W. Blackburn, formerly of the Union Pacific shops at Denver, Colo., has been appointed General Car Foreman of the O. S. L. at Salt Lake City, Utah.

Plant System.—W. W. Shipman has been appointed Soliciting Agent, with office at Savannah, Ga., succeeding G. L. Caldwell, who has been transferred to Ocala, Fla.

Sioux Falls Terminal.—At the annual meeting of this company held in Sioux Falls, S. D., June 15, the following officers and Directors were elected: President, C. O. Bailey; Vice-President, J. H. Voorhees; Secretary and Treasurer, D. P. Beech. Directors: C. O. Bailey, D. P. Beech and J. H. Voorhees of Sioux Falls, and Albert Civarc and Stephen H. Bell of New York.

Southern.—W. D. Allen, District Passenger Agent, with headquarters at Augusta, Ga., has resigned, and is succeeded by George B. Allen. W. D. Allen goes to Baltimore, Md., to accept a position as Secretary and Treasurer of the Building and Loan Association. He had been with the company for several years, and was at Jacksonville, Fla., before going to Atlanta. The resignation was effective June 15. George B. Allen, the new agent, has been Chief Clerk to Assistant General Passenger Agent S. H. Hardwick at Atlanta.

Southern Pacific.—W. H. Masters, who for the past year has represented the S. P. on the board of the Southwestern Traffic Association in St. Louis, has been appointed Assistant Traffic Manager, with headquarters in New Orleans. Mr. Masters was formerly Commissioner of the New Orleans Bureau of Freight Transportation, and before that was General Freight Agent of the Gulf, Colorado & Santa Fe for seven years. He has been in railroad service for 29 years.

Toledo, St. Louis & Kansas City.—Warren H. Fogg, Passenger and Assistant Ticket Agent of the Missouri Pacific, at Kansas City, Mo., has been appointed Traveling Passenger Agent of the T., St. L. & K. C., succeeding W. G. Knittle, resigned. J. E. Johnson, for several years Superintendent of Bridges and Buildings, has resigned.

Wabash, Chester & Western.—C. H. Sharman has been appointed Superintendent, with office at Chester, Ill., succeeding J. R. Hawkins, resigned.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

ABERDEEN & ASHEBORO.— Grading is nearly finished on the extension of the Troy Branch from Troy, N. C., south 14 miles to Mt. Gilead. (April 29, p. 317.) Gibson & Carpenter have the contract. (Official.)

ALABAMA & TOMBIGBEE.—Four miles of track has been laid on this line from Lower Peach Tree, Ala., east 37 miles to Coffeeville. Only 35 men are at work, and the line runs through a rough country, so that progress is very slow. (Jan. 28, p. 70.) George R. Hannon of Fulton, Ala., is General Manager. (Official.)

AMHERST & EASTERN.— This company has decided to make surveys for its proposed line from Amherst, N. S., east about 15 miles via Truemanville and Chapman Settlement, to the North Shore.

ARKANSAS CENTRAL.—Track is laid from Ft. Smith, Ark., east, to a point two miles beyond Charleston, 30.5 miles, and grading is in progress to Paris, 18 miles beyond Charleston. The line is projected to Little Rock and Hot Springs, about 170 miles. The work is being done by the company. (Feb. 25, May 27, pp. 148, 382.) N. B. Campbell of Ft. Smith, Ark., is General Manager. (Official.)

ASHLAND & WORCESTER.—The right of way is nearly all secured, according to report, and work is to begin about July 15 on this line from Jewett, O., through Stark County, 52 miles to Ashland. H. B. Camp, of Akron, O., is president and general manager. (Apr. 9, p. 267.)

ATLANTIC COAST LINE.—The Southeastern extension through Robeson County, N. C., from Elrod, southeast 10.25 miles to Ashpole (Feb. 25, p. 148), is completed. (Official.)

BEAUMONT WHARF & TERMINAL.— About three miles of track is laid on this belt line at Beaumont, Tex. (March 18, p. 208.) This includes one mile of track belonging to the Gulf, Beaumont & Kansas City, which is used under lease. W. W. Willson, of Beaumont, is Vice-President. (Official.)

CANE BELT.— Rails are laid from Lakeside, Tex., to Matthews, 4.5 miles on this line incorporated last March, in Texas, to run from Eagle Lake on the Southern Pacific, south 15 miles via Lakeside to Bonus. (April 1, p. 245.) W. T. Eldridge of Eagle Lake is Vice-President and General Manager. (Official.)

CENTER & TENEHA.—Six miles is graded on this line from Teneha, Tex., south 11 miles to Center. (Feb. 11, p. 110.) A. R. Chandler of Center, is President. (Official.)

CHATTAHOOCHEE VALLEY.— A letter from this company states that surveys are in progress from Riverview, Ga., toward Columbus, Mott and Opelika, but it has not yet been fully decided as to which of these places will be used for a terminus. L. Lanier, of West Point, Ga., is President. (May 6, p. 332.)

CHESAPEAKE BEACH.— Twelve miles of rail is laid from Washington, D. C., to Marlboro, Md., on this line from Washington, east 30 miles to Chesapeake Beach, Md. (May 20, p. 366.) L. H. Hyer, Washington, D. C., is Chief Engineer of the Chesapeake Bay Construction Co., which is building the road. (Official.)

CHICAGO, BURLINGTON & QUINCY.— Official denial is made that this company purposes to build a branch from Denver, Colo., to Alliance, Neb. (May 13, p. 348.)

CHICAGO, INDIANA & EASTERN.—Track is laid for 11 miles from Fairmount, Ind., to Swayzee, on this line, projected from Converse, Ind., southeast 79 miles to Richmond. (Dec. 24, 1897, p. 919.) The sections from Swayzee to Converse, seven miles, and from Matthews to Muncie, 15 miles, are under construction. H. U. Drew, of Fairmount, Ind., is General Manager. (Official.)

CHOCTAW, OKLAHOMA & GULF.— Track is laid as far as Geary, 17 miles, on the extension from Ft. Reno, Okla. Ter., west, 47 miles toward Arapahoe. Grading is in progress on the extension from Wister, I. T., east, seven miles to a point on the Kansas City, Pittsburgh & Gulf. (March 18, p. 208.)

COAHUILA & ZACATECAS.—This line from Saltillo, State of Coahuila, Mex., on the Mexican National southwest 78 miles to Concepcion del Oro, which was completed in March, is to be formally dedicated by the Governor of Zacatecas during this month. (April 29, p. 317.)

COLORADO & NORTHWESTERN.— Surveys are reported completed and the line cross-sectioned from Sunset, Colo., southwest to Eldora. Contracts, it is stated, will be let within a few days. The portion of the line from Sunset west 13 miles to Ward is completed. (April 8, p. 265.)

The company has begun surveys, according to report, for a spur at Boulder, Colo., to the Chatauqua grounds.

DELAWARE, SUSQUEHANNA & SCHUYKILL.— During the past six months this company has extended its Oneida Branch to New Harwood, Pa., 0.77 mile. (Official.)

DENVER & RIO GRANDE.— The proposed extension to the Dolly B. and Ibex Mines, near Leadville, Colo. (May 27, p. 282), has been under consideration by the company for the past two years, but has not yet been determined upon. (Official.)

DES MOINES, NORTHERN & WESTERN.—This company expects to ballast its road from Des Moines, Ia., to Adel, 24 miles, this year. (Official.)

DETROIT & LIMA NORTHERN.— All the grading is completed on the extension of the Columbus & Northwestern, from St. Mary's, O., southeast 50 miles through St. John's and Bellefontaine to Peoria. (Jan. 10, p. 420.) Track is laid between Bellefontaine and St. John's, 24 miles, and of this, 20 miles is ballasted. Two trains per day run between these points. (Official.)

DULUTH & IRON RANGE.—The 18.5 miles of new road from Waldo, Minn., to Colquet River Junction, is completed (Mar. 4, p. 169). A spur track of five miles is projected from the junction of the new track just completed at Waldo, to connect with ore docks at Two Harbors, Minn. J. L. Greatsinger is President and General Manager, Duluth, Minn. (Official.)

EAST ST. LOUIS BELT.—This company has been incorporated in Illinois, with a capital stock of $500,000, to run a belt line around the east side of East St. Louis. The incorporators and first Board of Directors are: Julius S. Walsh, E. P. Bryan, James Hanna, J. M. Hamill, F. C. Daab.

ELGIN, JOLIET & EASTERN.—This company is building a spur track to reach a slip at Waukegan, Ill., in connection with the main harbor built by the Government. (May 13, p. 348.) The slip is 800 ft. long and 125 ft. wide, and will have 17 ft. of water. The company expects to have its work completed by Aug. 15. (Official.)

EL PASO & NORTHEASTERN.—Track is laid from El Paso, Tex., to Alamogorda, N. M., 86 miles, on this proposed line from El Paso, northeast 160 miles to White Oaks, N. M. (May 27, p. 382.) Work is in progress on the branch from Alamogorda, east 20 miles to the Sacramento Mountains. George S. Good & Co., of El Paso, Tex., have the contract for the main line and branch. J. L. Campbell, of El Paso, is Chief Engineer. (Official.)

EL PASO SOUTHERN.—Three-fourths of a mile of a track is laid on this terminal line at El Paso, Tex. The company was incorporated in 1897, to build terminals at El Paso and a bridge across the Rio Grande, for the use of the Rio Grande, Sierra Madre & Pacific. (March 12, 1897, p. 195.) J. P. Ramsey, El Paso, Tex., is General Manager.

GULF, BEAUMONT & GREAT NORTHERN.—John H. Kirby of Houston, Tex., President of this company, is reported to have gone east and will let contracts for a portion of this road on his return. The G., B. & G. N. was organized in Texas a few weeks ago to take over the property of the Gulf, Beaumont & Kansas City, and to make extensions north from Beaumont through Jasper, San Augustine, Center, Carthage, Marshall and Jefferson to Paris, a point on the Texas & Pacific. (April 8, p. 266.)

HIGHLAND & ST. JOSEPH.—Contracts will be let in about six weeks for this proposed line, incorporated in Kansas, to run from a point on the St. Joseph & Grand Island, near Severance, Kan., north 7.5 miles to Highland. (June 3, p. 399.) The officers are: President, W. M. Brown; Secretary, James L. Allen, both of Highland. (Official.)

ILLINOIS CENTRAL.—Surveys are completed and the line is building from Black Bayou on the Tallahatchie Branch of the Yazoo & Mississippi Valley, southeast 20 miles via Philipp, Miss., to Greenwood. (June 10, p. 420.) All contracts are let. J. C. Neely, of Philipp, has the grading and bridging. The iron bridge work will be done by the Detroit Bridge and Iron Works. About ½ a mile of grading and several miles of clearing are finished. The line has light grades and curves and is mostly a light fill. The rails will be 61½ lbs., relieved from the main line. No new rolling stock is required. An iron bridge over the Yalobusha River will consist of a draw span and probably one fixed span. (Official.)

On the Vicksburg Division of the Yazoo & Mississippi Valley line considerable roadbed improvement is in progress, including ten miles of new 75-lb. rail to replace old rail, and considerable ballasting. A large portion of this track was under water last year on account of the overflow of the Mississippi levees, which makes the ordinary repair work heavier than usual this year. (Official.)

INDIANA & SOUTHEASTERN.—Grading is completed and track-laying begun on the extension from Anderson, Ind., east 18 miles to Muncie. (May 20, p. 366.) J. W. Moore of Anderson, Ind., is Chief Engineer. (Official.)

LAKE ERIE & WESTERN.—Work was begun June 15, according to report, on the extension from Akron, O., east 85 miles to Newcastle, Pa., to connect with the extension now building of the Buffalo, Rochester & Pittsburgh. George Hugill of Akron has been awarded the contract.

LEHIGH VALLEY.—Trains began running June 16 on the new Seneca County extension from Geneva Junction, N. Y., east eight miles to Seneca Falls. (June 10, p. 421.)

LITTLE RIVER VALLEY.—About four miles of track is laid on the extension of this line from Morris Ferry, Ark., west eight miles to the Indian Territory line. (March 4, p. 170.) D. C. Richardson, Horatio, Ark., is President. (Official.)

LOUISIANA NORTHWEST.—Track-laying is in progress on the extension of this road from Homer, La., northwest 36 miles to Magnolia. (Jan. 21, p. 50.) J. D. Beardsley of Gibsland, La., is General Manager. (Official.)

MEXICAN CENTRAL.—Track is laid for 27 miles on the Parral extension from Jimenez, Mex., southwest 55 miles via Orion, Troya and Baca to Parral. (May 20, p. 367.) H. R. Nickerson of Mexico City is General Manager. (Official.)

MEXICAN INDUSTRIAL.—This company expects to complete during this month its belt line of 9.5 km. (5.9 miles) about the City of Mexico. It will connect all the railroads entering the city and includes various extensions and branches. The plan includes a connecting line to San Nicholas, making a total length of 28.5 km. (17.6 miles.) The contracts are let to local contractors. The officers are given under

NORFOLK, VIRGINIA BEACH & SOUTHERN.—The 22 mile extension, from Kempville, Va., southeast to Munden Point (Mar. 18, p. 208, May 6, p. 332), known as the Currituck Division, was finished in April, and scheduled train service went into effect June 1. On account of the increased traffic from this new division, the company has purchased several tracts of land in Norfolk, Va., to make a new deep-water terminal. There will be accommodation at the wharfs at the new terminal for six vessels to be loaded at the same time, with new and improved appliances for handling freight.

NORTHERN PACIFIC.—Surveys are completed for building the Clarke Fork Branch from Rockvale, Mont., on the Rocky Fork Branch, south through the Clarke Fork Valley, 12 miles, to Gebo, where are located the mines of the Clarke Fork Coal Co. Mr. Mike Elmore of Alliance, Neb., has the contract. Work was begun June 1. The work is light, the maximum grades not exceeding 21 ft. to the mile. There are no important trestles or bridges. (May 27, p. 383.) The rails and rolling stock will be furnished by the N. P. (Official.)

The contract for grading, bridging and iron work on the extension from Belmont, Man., west about 50 miles to Hartney, has been awarded to J. D. McArthur, of Winnipeg, Man.

The improvements in progress on the Rocky Mountain division consist chiefly in replacement of about twenty miles of old 56-lb. rails by new 72-lb. rails. A grade and line revision is in progress on the main line, about seventy-five miles west of Jamestown, N. Dak. The work involves the building of about nine miles of new line, and reducing the former 1 per cent grades to 0.4 per cent. Winston Bros. have the contract, and work is actively progressing. (Official.)

PENNSYLVANIA.—Trains were run over the new Bacon Hill (Md.) cut-off on the Philadelphia, Wilmington & Baltimore line, this week, for the first time. (May 20, p. 367.)

The spur from the Scalp Level extension east five miles to the Babcock Lumber Co.'s mills is reported completed. ("New Roads," Jan. 21, p. 50.)

PITTSBURGH & WESTERN.—The company is not building any second track between Haselton, Pa., and Mahoningtown, as some newspapers have reported, but is putting in some long sidings. (Official.)

RALEIGH & CAPE FEAR.—About seven miles is graded and three miles of track laid on the line from Raleigh, N. C., south toward Lillington, 35 miles. (April 29, p. 317.) John A. Mills, of Raleigh, is President. (Official.)

REYNOLDSVILLE & FALLS CREEK.—During the past six months, this company has built three short branches aggregating 1.8 miles, all in Pennsylvania, from London Mine to Pancoast Mine, 0.4 mile; from Rathmel to Maplewood Mine, 0.2 mile; and from Rathmel to Feeley Run Mine, 1.2 miles. (Official.)

SHREVEPORT & RED RIVER VALLEY.—Track-laying is practically completed on this line from Shreveport, La., south 45 miles to Coushatta. (April 22, p. 301.) Hunter Bros., and the Grigsby Construction Co., both of Shreveport, have the contract. The company purposes making an extension from Shreveport to St. Maurice, 30 miles. George E. Otis of Shreveport is Chief Engineer. (Official.)

SOUTHERN.—Track-laying is practically completed on the extension of the North Carolina Midland from Mocksville, N. C., northeast 27.4 miles to Mooresville. (May 6, p. 332.) W. H. Wells of Cleveland, N. C., is Engineer in Charge. (Official.)

SOUTHERN PACIFIC.—The new building by the Pacific System in California during the past six months includes the branches as follows: From Ventura Junction, to Nordhoff, 15 miles; from Montalvo to Oxnard, 4.4 miles; from Pomona Junction to Chino, 4.51 miles. (Official.)

STILLMORE AIR LINE.—This company has completed during the past six months five miles of the main line at Stillmore, Ga. (Dec. 24, 1897, p. 920.) A fraction of a mile was laid last year. (Official.)

SUGAR CREEK.—The proposed route of this line, incorporated in West Virginia, in May, is from McDonald, W. Va., the terminus of the Loop Creek Branch of the Chesapeake & Ohio, up Sugar Creek and down Park's Branch to Paint Creek, then up Paint Creek to Raleigh Courthouse, in all 15 miles. (May 27, p. 383.) No surveys have yet been made but the character of the work will be easy. J. W. Davis, of Coffman, W. Va., is President. (Official.)

TOLEDO & NORTHWESTERN.—About 20 miles of the line from Albion, Mich., north to Charlotte on the Chicago & Grand Trunk, is graded and the company proposes to extend its line from Albion, south to Hanover, 16 miles. (April 15, p. 285.) Sam A. Williams, of Albion, is General Traffic Manager. (Official.)

WASHINGTON COUNTY.—The County of Washington, Me., has sold $200,000 4 p. c. 30-year bonds at 100.875 to aid the W. C. road. Recently this company bought the St. Croix & Penobscot, which extends its line from Calais, Me., northeast 21 miles to Princeton. (June 3 and 10, pp. 399 and 422.)

WELLINGTON & POWELLSVILLE.—Grading is about completed and all but three miles of track laid from Windsor, N. C., north, to Ahoskie. (April 29, p. 317.) J. W. Branning, of Edenton, N. C., is President. (Official.)

WEST VIRGINIA CENTRAL & PITTSBURGH.—Contract has been let, according to report, with the Columbus, O., Construction Co., to build an extension from Beverly, Md., south 11 miles to Huttonsville. Work is to begin at once, and the contract calls for its completion by Oct. 1.

Electric Railroad Construction.

ALBANY, N. Y.—Work is under way on the Albany end of the Albany, Helderberg & Schoharie Electric Ry. Co. The Albany Construction Co. has the general contract. (May 27, June 10; pp. 383, 421.)

The Albany Ry. Co. is to make two extensions to the South End, one on Madison Ave. to Lark St., and one on Delaware Ave. to Morton St.

BOSTON, MASS.—The Railroad Commisioners give a hearing June 21 to the West End St. Ry. Co. on the matter of extending the trolley on Walnut and Humbolt Avenues and Seaver St.

CHICAGO.—On May 26 the Appellate Court reversed the order of injunction issued on application of Montgomery Ward & Co., restraining the Chicago City Ry. from erecting poles on Michigan Avenue between Madison and Randolph Streets. (April 8, p. 266.) The court held that complainants failed to show whether Michigan Avenue is legally a street or a part of Lake Front Park, which showing is absolutely essential to the case. Montgomery Ward & Co. at once entered motion for leave to file amendments to the bill, and for a temporary injunction on the bill as amended. On June 13, in the Superior Court of Cook County, Judge Ball refused to grant the preliminary injunction asked for, reviewing at length the history of the park since it came into possession of the city in 1844. Judge Ball's decision was announced about 11 a. m., June 13, and by 1 p. m. the same day the trolley equipment was completed and the cars were running. This completes the temporary surface loop authorized by Mayor Harrison, under bond that when the track elevation which made it necessary is completed the company will remove the line of the temporary loop.

DAYTON, O.—The Dayton & Western Traction Co. has begun running its cars regularly from Dayton to West Alexandria, in Preble County, 18 miles. The extension from West Alexandria to Eaton will be completed in a few weeks.

DENVER, COL.—An ordinance is before the City Council to permit the Denver City R. R. Co. to change its cable road to an electric.

The Colfax Ave. Electric Ry. Co. has applied for a franchise to build an extension to connect the Denver Consolidated Tramway terminal and Montclair.

DETROIT, MICH.—The Detroit, Plymouth & Northville Ry. Co. is chartered with a capital stock of $150,000 to build an electric railroad from Detroit through the villages of Dearborn, Wayne, Plymouth and Northville, and the townships of Springwells, Dearborn, Canton, Mantou, Van Buren and Plymouth in Wayne County, the cities of Ypsilanti and Ann Arbor and townships of Superior, Pittsfield and Ann Arbor in Washtenaw County. The incorporators are John A. Russell, Henry P. Wickham, Chas. W. Casgrain, Thomas E. Griffin, Detroit; John C. Calahan, Wyandotte, Mich.; James F. Woolley, Brooklyn, N. Y.

The Detroit, Lake Shore & Mt. Clemens Ry Co. has filed with the City Council of Mt. Clemens a request for a franchise along certain streets to the terminus of the Mt. Clemens & Lakeside Traction Co. The object of it is to afford cars a continuous route in connection with the traction company's present tracks to all the principal hotels and bath houses in the city, and practically solves the downtown loop question so far as these companies are concerned.

FALL RIVER, MASS.—The Fall River & Newport Electric RR. Co. commenced operating through cars between the two cities June 19.

FARGO, N. DAK.—An ordinance is before the City Council to give a street railroad and electric lighting franchise to President von Neida, of the Red River Bank.

LIMA, N. Y.—The Lima & Honeoye Falls Electric Ry. Co. is now getting poles and wires in place and expects to have the road in operation in July. (Feb. 11, Apr. 22; pp. 111, 301.)

MILWAUKEE, WIS.—The Milwaukee & Waukesha Electric Railroad Co. has completed its line between the two cities and the cars are running. The road will be extended further westward to the Waukesha County lake district.

NEW BRUNSWICK, N. J.—The Brunswick Traction Co. has let contracts for extensions from Bound Brook to Dunellen and from Bound Brook to Somerville. A number of small county bridges and culverts must be crossed, for which permission must be had from the freeholders of Middlesex and Somerset counties. The bridges will have to be widened and strengthened at the trolley company's expense.

OSHKOSH, WIS.—The Oshkosh, Omro & Berlin Electric Ry. & Construction Co. was recently organized with a capital of $25,000, to be increased to $500,000. Among those interested are: J. H. Jenkins, Seymour Hollister, W. Himebaugh, Nathan Paine, Jas. Hume, W. J. Wagstaff, R. C. Russ, A. B. Ideson, Charles Barber and H. Gile.

PLAINFIELD, N. J.—The Plainfield Street Ry. Co. will build an extension of a few miles to Washingtonville.

SCHENECTADY, N. Y.—The Schenectady Ry. Co. contemplates building an extension to South Schenectady.

SEATTLE, WASH.—The Grant Street Electric Ry. Co. is making extensive improvements to the road and rolling stock, and is building a loop of about four miles.

STAMFORD, CONN.—The trolley equipment of the New Canaan Branch of the New York, New Haven & Hartford, from Stamford to New Canaan, about six miles, will be completed about July 1. (Apr. 15, p. 285.)

SYCAMORE, ILL.—The Geneva Lake, Sycamore & Southern Electric Ry Co. has secured rights of way and a 50-year franchise through the length of the proposed line from Geneva Lake, Wis., to Morris, Ill. (Feb. 18, June 3, pp. 131, 400.)

VALDOSTA, GA.—The Valdosta St. Ry. Co. is reported chartered with a capital of $50,000 to build an electric railroad. T. G. Crawford and Frank Roberts are among those interested.

VICKSBURG, MISS.—Mr. J. C. Shaffer, Marquette Building, Chicago, has received a franchise for building an electric railroad in Vicksburg. It will be operated in connection with the lighting plant which is owned by Mr. Shaffer.

WASHINGTON, D. C.—Congress has passed a bill giving a charter to the East Washington Heights Traction Co. The act authorizes the company to build an electric road in several directions from the east end of the Pennsylvania avenue bridge. It also provides that free transfers shall be exchanged between the Capital Traction Co. and the East Washington Heights Co., so that within the next 18 months, the time fixed for the completion of the road under this act, it will be possible for a passenger to ride from Chevy Chase in Maryland to East Washington Heights, a total distance of about 12 miles, for one fare. Ex-Congressman A. M. Bliss of Brooklyn is interested in the project.

GENERAL RAILROAD NEWS.

Railroad Earnings.

Showing the gross and net earnings for the periods ending at the dates named:

April 30:		1898.	1897.	Inc. or Dec.	
Burlington, Cedar Rapids & Northern.					
1 month	Gross	$310,982	$254,094	I.	$56,888
1 "	Net	94,888	66,631	I.	28,257
4 months	Gross	1,279,873	1,189,334	I.	90,539
4 "	Net	442,872	420,280	I.	22,592
Central of Georgia.					
1 month	Gross	$311,180	$317,529	D.	$6,700
1 "	Net	27,961	39,813	D.	11,852
10 months	Gross	4,813,942	4,616,609	I.	197,333
10 "	Net	1,703,216	1,695,018	I.	8,198
Central Pacific.					
1 month	Gross	$1,336,463	$1,017,647	I.	$319,816
1 "	Net	536,114	370,780	I.	165,334
4 months	Gross	3,738,448	3,524,139	I.	214,309
4 "	Net	1,246,476	1,093,919	I.	152,557

Colorado Midland.

1 month	Gross	$117,494	$133,527	D.	$16,033
1 "	Net	13,914	36,278	D.	22,364
10 months	Gross	1,474,151	1,398,591	I.	75,560
10 "	Net	301,849	255,176	I.	46,673

Lake Erie & Western.

1 month	Gross	$276,838	$272,072	I.	$4,766
1 "	Net	91,798	94,813	I.	3,015
4 months	Gross	1,107,769	1,064,186	I.	43,573
4 "	Net	439,299	434,064	I.	5,253

Minneapolis, St. Paul & Sault Ste. Marie.

1 month	Gross	$338,061	$288,983	I.	$50,078
1 "	Net	177,694	116,454	I.	77,694
10 months	Gross	3,478,727	2,981,466	I.	497,261
10 "	Net	1,613,372	1,209,405	I.	404,967

Missouri, Kansas & Texas.

1 month	Gross	$876,495	.....		.....
1 "	Net	202,099	.....		.....
10 months	Gross	10,614,448	.....		.....
10 "	Net	3,556,154	.....		.....

May 31:		1898.	1897.	Inc. or Dec.	
Baltimore & Ohio.					
1 month	Gross	$2,427,550	$2,027,329	I.	$400,221
11 months	Gross	25,146,385	23,373,323	I.	1,773,062
Cincinnati, New Orleans & Texas.					
1 month	Gross	$463,544	$304,848	I.	$158,696
1 "	Net	193,017	109,229	I.	83,788
11 months	Gross	3,717,071	3,141,172	I.	575,899
11 "	Net	1,250,352	993,922	I.	256,430
Pittsburgh, Cincinnati, Chicago & St. Louis.					
1 month	Gross	$1,256,577	$1,100,779	I.	$155,798
1 "	Net	228,039	249,103	D.	21,064
5 months	Gross	6,362,654	5,362,654	I.	818,926
5 "	Net	1,426,465	1,268,817	I.	157,648

ATCHISON, TOPEKA & SANTA FE.—A close traffic agreement has been made by the Atchison with the Pecos Valley & Northeastern, now under construction, which provides for a junction of that road at Amarillo, Tex., to which point the Atchison has recently made connections through the purchase of the Panhandle Branch of the Ft. Worth & Denver City from Panhandle to Washburn, Tex., 16 miles, and by acquiring trackage rights over the Ft. W. & D. C. from Washburn to Amarillo, 15 miles. (Apr. 15, p. 286.) The new contract provides for the use of the P. V. & N. E. tracks by the Atchison, but the officials of the latter road state that it is not proposed to exercise this privilege for the present.

ATLANTIC COAST LINE.—Stockholders of the Petersburg R. R. and the Richmond & Petersburg R. R., two companies of the A. C. L., vote July 20 on the proposition to consolidate the roads under the bill passed by the last Virginia Legislature. The title of the new company will be the Atlantic Coast Line R. R. Co. of Virginia.

BALTIMORE & OHIO.—The general terms of the plan of reorganization have been announced as follows: The following new securities are to be created: $70,000,000 3½ p. c. prior lien bonds on the main line; $63,000,000 4 p. c. first mortgage bonds, which are also a second mortgage on the lines covered by the prior lien mortgage; $40,000,000 preferred stock; $35,000,000 common stock. The present common stock is to pay $20 assessment, for which an equal amount of preferred stock will be given. It is estimated that after the completion of the reorganization the fixed charges, including taxes, will be about $6,250,000. Since the net earnings for the year ending June 30 next are estimated at $7,750,000, this will leave practically 4 p. c. on the new preferred stock. A syndicate has been formed which will provide over $30,000,000 cash to meet the requirements under the new plan. (June 10, p. 421.)

BUSK TUNNEL.—The Reorganization Committee, of which A. E. Hambro is Chairman, requests holders of first mortgage bonds to deposit the same with C. J. Hambro & Son, 70 Old Broad St., London, E. C., where copies of the committee's report as to the present position can be obtained. This company was chartered June 16, 1890, to build a line from Busk, Colo., to Ivanhoe, 2.9 miles, including 1.78 miles of tunnel. The line was leased to the Colorado Midland, but was not included by that company in its reorganization last year. The capital stock is $10,000, and the funded debt $1,250,000.

CHICAGO & EASTERN ILLINOIS.—This company has notified the New York Stock Exchange of a proposed increase of $1,628,000 in its preferred stock, making a total issue of $6,459,600. Of this increase $628,000 will remain in the treasury for future uses. The remaining $1,000,000 has been sold and the money expended in general improvements, for air brakes and other improvements required by the Interstate Commission; for the retirement of car trust notes, and in payment of obligations to the Chicago, Paducah & Memphis, acquired in March, 1897.

CHICAGO, BURLINGTON & QUINCY.—The following bonds have been called for payment July 1 for the sinking fund at the New England Trust Co., Boston; Republican Valley 6 per cents., due 1919, 14 for $1,000 each and 7 for $600 each; Burlington & Missouri River R. R. Co., of Nebraska, nonexempt consolidated 6 per cent. bonds, due 1918, 114 for $1,000 and 23 for $600 each.

GREAT NORTHERN.—The Eastern Ry. of Minnesota has filed a deed to secure an issue of 4 per cent. 50-year gold bonds, not to exceed $15,000,000. The deed covers all the first division of the road from Hinckley to Duluth and the entire new Fosston extension. The money is to be used for building the Fosston branch, for buying other branches and in redeeming old bonds, of which $4,700,000 is outstanding. (June 17, p. 446.)

GULF AND INTERSTATE.—The company has applied to the Texas State Railroad Commission for authority to cancel all its capital stock, except an amount equal to $1,000 per mile, and to issue bonds in lieu thereof, making the capitalization $71,000 stock and $900,000 bonds. The road is in operation from Port Bolivar, Tex., to Beaumont, 71 miles.

INDIANA & LAKE MICHIGAN.—Arrangements are being made with Judge Woods at Indianapolis, Ind., for a decree of sale of this road, which runs from South Bend, Ind., to St. Joseph, Mich, 39.29 miles. This company was formed in 1888 as a consolidation of the I. & L. M. of Indiana and the I. & L. M. of Michigan. It was leased for 99 years to the Terre Haute & Indianapolis, and went into the hands of a receiver in November, 1896.

KANSAS CITY, OSCEOLA & SOUTHERN.—The lines of this company, which extend from Kansas City, Mo., southeast to Osceola, 112 miles, will be turned over to the St. Louis & San Francisco on July 1, and the connecting link to Bolivar, now building, will be completed about that time. (Dec. 12, 1897, p. 806.)

LITTLE ROCK & MEMPHIS.—The foreclosure sale has been postponed again, this time from June 21 to Oct. 25. (May 20, p. 368.)

MISSOURI, KANSAS & TEXAS.—The suit of the Mercantile Trust Co. referred to two weeks ago (p. 422) is declared by an official of the company to be a mere revival of a suit commenced over six years ago, which was long ago thought to be dead, for an accounting during the time when the company was in the hands of a receiver. The supplemental complaint recently filed makes claim that interest was earned which was not paid over, and that accounts were not duly rendered. The railroad company in reply to this states that no moneys were earned applicable to the payment of interest which were not paid over; that the accounts during the period of the receivership were periodically rendered to the Mercantile Trust Co., and that such accounts show that there were, in fact, no net earnings applicable to the payment of interest.

NEW YORK, NEW HAVEN & HARTFORD.—The stockholders on June 15 voted to lease the property of the New England for 99 years, and the property of the Shepaug, Litchfield & Northern for 75 years, both from July 1. The other companies have already consented to the leases. (May 27, p. 384.)

PITTSBURGH & WESTERN.—The Receiver of the P. & W. has bought the Ellwood Short Line, which runs from North Sewickley, Pa., to Rock Point, 3.1 miles. This road was opened in 1891, and leased that year to the P. & W. for 30 years. The capital stock is $300,000, with an equal amount of funded debt.

POUGHKEEPSIE & EASTERN.—Judge Barnard at Poughkeepsie, June 17, appointed Joseph J. Slocum of New York, brother-in-law of Russell Sage, to be Temporary Receiver, upon request of Mr. Sage, President of the road, who has brought proceedings for voluntary dissolution of the company. This line runs from Poughkeepsie, N. Y., to Boston Corners, 39.79 miles. It was chartered in April, 1893, as successor to the New York & Massachusetts, which was sold under foreclosure the preceding March. The capital stock is $500,000. The first mortgage 5 p. c. gold bonds for $500,000, due Nov. 1, 1934, were sold last week by Richard V. Harnett & Co. at 20 p. c. The road had a deficit last year, after payment of taxes, of $9,447.

ST. PAUL UNION DEPOT.—The stockholders have authorized an issue of $100,000 bonds for improvements, which will increase the funded debt to $500,000.

SPOKANE FALLS & NORTHERN.—Negotiations are understood to be in progress by the Northern Pacific to buy the S. F. & N., which runs from Spokane, Wash., north to the international boundary line, 140.6 miles.

SOUTHERN PACIFIC.—Sealed proposals will be received up to noon, June 30, at the office of the company, 4 Montgomery street, San Francisco, for as many of the S. P. R. R. Co. of Arizona first preferred 6 p. c. bonds as $65,000 will buy.

TEXAS WESTERN.—Judgment was rendered in the District Court at Austin, Tex., June 17, against this company, forfeiting its charter, dissolving the corporation and appointing Harry Haynes, of Brenham, Receiver. The line runs from Houston, Tex., to Sealy, 53 miles, and has not been operated for the past two years, which is the ground for forfeiting the charter. (May 13, p. 350.)

Electric Railroad News.

BUFFALO, N. Y.—Albert C. Emmerick was appointed Receiver of the Buffalo, Kenmore & Tonawanda Electric RR. Co. on application of the Fidelity Trust & Guaranty Co., which holds a mortgage for $55,000 against the road. Mr. Emmerick is head bookkeeper for the railroad.

CHICAGO, ILL.—Press reports state that the directors of the Chicago City Ry. Co. have voted to refer for ratification at the next annual meeting of the stockholders of the company in January, 1899, a plan to raise the capitalization of the company to $14,000,000, thus making an increase of $2,000,000. The object of the increase is partly to meet expenses incurred in acquiring the General Electric Ry., and partly for paying for the numerous extensions contemplated in the franchises for which the city is now being asked.

DETROIT, MICH.—The Detroit, Lake Shore & Mt. Clemens Ry. has made a mortgage with the New York Security and Trust Co., to cover an equal amount of bonds. Part of the proceeds of the bonds is to be used in retiring the bond issue of $260,000, dated July 1, 1897. A sinking fund is to be created for the payment of $5,000 annually, after 1901.

FORT SCOTT, KAN.—The Fort Scott Rapid Transit Co., a trolley road, operated by the Davenport (Ia.) Investment Co., was sold to the Citizens' Ry. Co., composed of local men, and recently organized. (Jan. 14, p. 34.)

NEW YORK, N. Y.—On May 21, Secretary C. E. Warren of the Metropolitan Street Ry. Co. announced the decision of its Directors to increase the capital stock from $30,000,000 to $40,000,000. The stock was increased to $30,000,000 July 1, 1896. The increase is to be voted on by the stockholders. Of the new stock $6,000,000 will be devoted to the retirement of debentures and $4,000,000 to betterments and improvements. This comprehends changing the motive power in Sixth and Eighth avenues to electricity.

OTTUMWA, IA.—The sale of the Ottumwa Electric Ry. Co.'s property to Mr. E. E. McElroy, trustee for the bondholders, has been approved by the court, and the company will be reorganized at once. (June 10, p. 422.)

ST. LOUIS, MO.—The Central Traction Co., it is stated, will increase its capital stock July 31 from $100,000 to $5,000,000. This is a projected road which is trying for the same routes for which franchises were refused the North and South R. R. Co. The Central Traction promoters have filed a bond with the City Council for $250,000, signed by the Mississippi Valley Trust Co. (Mar. 18, p. 209.)

TRAFFIC.

Traffic Notes.

No agreement has yet been reached by the roads west of Chicago, for a restoration of rates on packing house product.

The Chicago Board of Trade, which recently withdrew its support from the Chicago Freight Bureau, has established a freight bureau of its own, under the direction of a transportation committee of nine members. The Manager of the bureau is John J. Hyland, a railroad traffic man of long experience, and lately with the Ontario Dispatch.

At Kansas City last week a meeting of jobbers was held to consider the formation of a merchants' association, to secure reduced passenger fares, as has been done at New York and other cities; but the proposition was rejected and the jobbers will adopt the plan employed by them in former years, of making to the country merchants a cash allowance for their railroad fare.

The reduced second-class eastbound rates from San Francisco are now available on rebate orders via El Paso, Mojave and Ogden. The net rates quoted by the Southern Pacific from San Francisco are: to Missouri River points, $31; St. Louis, $37; Chicago, $32.50; New York and Boston, $42.55. East of Chicago the tickets read over the Nickel Plate, the Panhandle, or the Baltimore & Ohio.

A press dispatch from St. Paul states that the Great Northern proposes to put in effect on July 15 a new local freight tariff, with rates lower than those demanded by the State Railroad Commissioners in the Steenerson case, which was litigated in the courts for a long time. The commissioners seem to think that the tariff now proposed by the railroad company will make a great saving for the farmers of the state.

Judge Newman, in the United States Court at Atlanta, Ga., has decided against the railroads in a long pending suit concerning freight rates from Cincinnati to points in Georgia short of Atlanta. Complaint was made that the long and short haul law was violated, the rates to Atlanta being much lower than to the complaining towns, and the Interstate Commerce Commission decided in favor of the roads; but Judge Newman decides the other way, holding that at Atlanta competition exists sufficient to justify the lower rate.

East bound grain rates are said to have been restored on June 13, as heretofore announced, but the grain movement appears to be rather light at present, and not much is said about rates. Rates by lake have not been advanced, and the reporters claim that there are still irregularities in all-rail rates. It is said at Cleveland that an agreement has been reached by which the lake and rail rate on flour and grain products shall be advanced to the basis of 15 cents from Lake Michigan ports and 17½ cents from Lake Superior ports, on July 1. Present rates are 12½ cents from Lake Michigan ports and 15 cents from Lake Superior ports. On Tuesday of this week the Board of Managers of the Joint Traffic Association recommended a reduction of rates on grain and grain products, except corn, from Chicago to New York, from 20 cents to 18 cents, to go into effect on June 27.

The wholesale merchants of St. Louis are greatly incensed at the Southern Pacific for its action in making a freight tariff from the East which favors Pacific Coast jobbers. This new tariff, referred to in our issue of June 3, p. 393, is to go into effect June 25, and Commissioner Vanlandingham, on behalf of the St. Louis merchants, threatens to get out an injunction if he can get a court to issue one. He declares that a more unjust, unreasonable and inexcusable tariff was never issued, and characterizes parts of it as unlawful. The St. Louis grievance is based not only on increased differences between carload and L. C. L. rates, but, in addition, numerous violent changes in commodity rates. Some of these latter are alleged to have been designed to force shippers to put goods in a multiplicity of packages. Articles which naturally move in mixed carloads have been classified in straight carloads, so that only large dealers can take advantage of the carload rates.

The railroads west of Chicago are said to have appealed to the Interstate Commerce Commission for aid in their passenger rate war with the Canadian Pacific, though it does not clearly appear what they expect the commission to do. The order of the commission allowing the suspension of the long and short haul law on passenger rates to the Pacific Coast, to meet the competition of the Canadian Pacific, expires soon. No settlement of the Canadian Pacific controversy is yet in sight. It is reported that the Western lines are endeavoring to secure sufficient support from the Eastern lines to enable them to put in effect nominal rates of fare between New York and North Pacific coast points, in the hope that the magnitude of such cuts will force the Canadian Pacific to settle. The question is now before the Board of Control of the Joint Traffic Association. The Western Passenger Association will, from July 1, use rebate orders on both East and West bound business in competition with the Canadian Pacific.

The Transcontinental Westbound Freight Tariff.

The new transcontinental freight tariff, lately agreed upon, to go into effect June 25, shows an advance of 25 per cent. in first-class, and of about 10 per cent. in the other numbered classes. In this tariff there are 10 classes, the last six being for carloads. The rates are the same to Pacific Coast terminals from New York, Chicago and the Missouri River, and from all intermediate points taking through rates. The present first-class rate is $2.40 and the new rate $3; second class, old $2.15, new $2.60; third, $2 and $2.20; fourth, $1.70 and $1.90. None of the rates in the carload classes are changed except Class B, which is advanced from $1.10 to $1.25. Corresponding advances are made in most commodity rates. "Intermediate" class rates are not changed.